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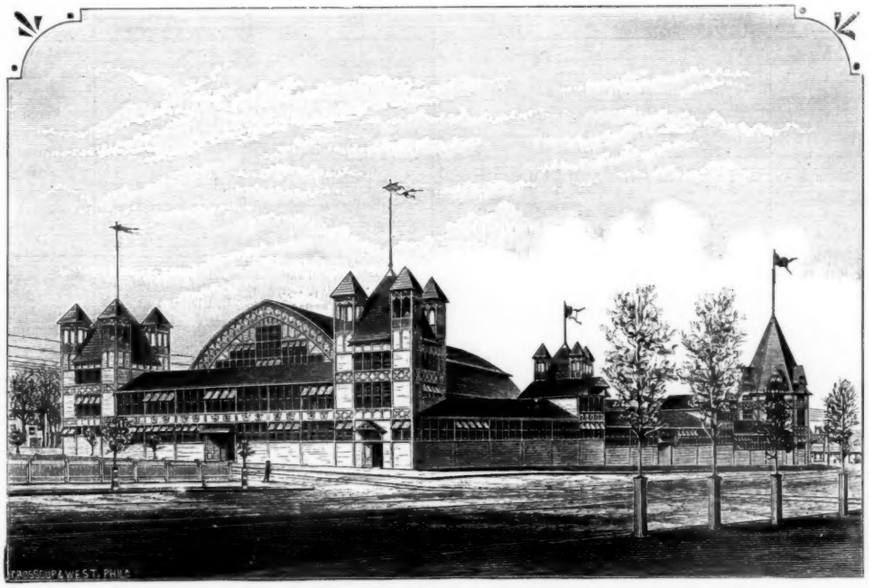
THE INTERNATIONAL ELECTRICAL EXHIBITION.

To be Held in Philadelphia Next Autumn.

THE NECESSITY FOR SUCH AN EXHIBITION IN AMERICA — DESCRIPTION OF THE BUILDINGS — OBJECTS OF THE EXHIBITION AND AIMS OF ITS PROJECTORS — A GENERAL INVITATION BEING SENT OUT MEETS WITH CORDIAL ACCEPTANCE.

Herewith will be found a view of the building in which the coming International Electrical Exhibition is to be held. The building is now in course of construction, the view having been taken from the architect's drawings.



VIEW OF THE BUILDINGS OF THE INTERNATIONAL ELECTRICAL EXHIBITION TO BE HELD AT PHILADELPHIA NEXT AUTUMN. TAKEN FROM THE ARCHITECT'S DRAWINGS.

It is safe to say that no country in the world is more in need of just such an exhibition, for in no country has electrical science met with such general application, and a necessity has long existed for a comparison of mechanisms and systems.

Only those who have struggled with electrical and mechanical problems can realize how advantageous is comparison to the experimenter.

Of twenty persons working in the same direction, it is safe to say that half of them can be of invaluable service to each other. One man has worked out one part of the problem, another has met with success in a different direction, and so on; and a mutual exchange of ideas cannot fail of being of mutual advantage.

It may be said without the fear of contradiction, and those who are familiar with the subject will bear out the assertion, that it was here in America that electrical science—that is to say, applied science—received its greatest impulse. It may be urged that Faraday worked out the natural law upon which the electric light of to-day is based, and that a German, Reis, worked out the problem of transmitting sound by electricity But who developed a means of making the electrical light of general utility? Who constructed a mechanism by which the telephone might be used by the public? Both were Americans.

No sooner was the electric light made a success here than it was adopted on the other side of the water; and the European world was so doubtful as to the practical utility of the telephone that it did not reap the benefits of this phenomenally useful invention until ong after it was in general use here. So it has been with many other electrical contrivances.

Philadelphia, the city chosen for the exhibition, possesses many advantages for such an enterprise. It is beautifully situated, and, being the second largest city in the United States, is accessible from every direction. It is only two hours from New York by rail, and can accommodate, as was seen at the Centennial Exhibition of 1876, as many visitors as may be attracted to it.

The exhibition will be held under the auspices of the Franklin Institute, which has been long and favorably known for the high character of its faculty and the scholarship of its members.

The preparations for the exhibition have so far progressed that rules and regulations have been prepared for the government of the enterprise and the classification of the exhibits. An official report, sent to the REVIEW, says:

The different groups will consist of: 1, apparatus for the production of electricity; 2, electric conductor; 3, measurements; 4, applications of electricity; under which there are two sub-divisions, apparatus of small power and that of large power; 5, terrestrial physics; 6, historical apparatus, and 7, educational and biographical. The section devoted to measurements is probably one of the most interesting to scientists, and the least known to the public of any of the exhibits. It is the purpose of the committee to make a notable departure from usual exhibition ideas, in not giving any medals or diplomas. The reports of the judges of each department will be given after the fashion of a jury, and will be a statement of the facts in regard to the size, speed, force, energy, resistance, and any other points of the exhibit which may call for mention. Instruments of precise measurement will be used by the committee of judges, and the conclusions reached will be the record of the judges. By a special arrangement with the Treasury officers, such instruments of precision as are not to be had in this country will be admitted without duty, on the bond of the Institute being given that they will be kept for the single use of the Institute at the exhibition. If arrangements can be made by the committee for an unbroken water front on the Schuylkill, the method of placing an electric light of 100,000 candle-power in the bed of the river, to discover torpedoes or other implements of warfare, will be exhibited by the Ordnance Department of the United States Navy.

Many responses have already been made to the first circular issued. France, Germany, and Austria have sent answers, but England has not as yet been definitely heard from. A second circular has been issued, and there is reason to believe that a very general desire will be evinced throughout Europe to be properly represented at the coming exhibition. As a matter of fact, it is hard to conceive how any electrical interests could afford to remain absent; for, as is well known, there is an immense amount of capital in this country awaiting investment in *bona fide electrical* enterprises of good promise. There is no adherence to old forms, no disinclination for innovation, which is continually being exhibited in Europe. American capitalists are ready to go into anything of real value; any means of efficiently and speedily performing that which heretofore has been a laborious process readily finds favor in their eyes.

The second circular sent out by the Franklin Institute gives detailed information concerning the exhibition that is to be. It includes the names of the committee of arrangements and the special committees, and the joint resolutions of Congress allowing exhibitors to have their goods admitted free of duty, and the circular of the Treasury Department instructing the Collectors of Customs in regard to the reception of goods destined for the Electrical Exhibition.

It also gives the rules and spaces for exhibits, the regulations governing the exhibition, and the charges for space.

All spaces under 10 square feet..... $2
From 10 to 100 square feet...20c. per sq. ft.

RATE PER SQUARE FOOT.

100	square feet at	20	cents.....	$20 00
200	" "	17½	"	35 00
300	" "	15½	"	46 50
400	" "	14	"	56 00
500	" "	13	"	65 00
600	" "	12¼	"	73 50
700	" "	11¾	"	81 00
800	" "	11	"	88 00
900	" "	10½	"	94 50
1,000	" "	10	" 100 00	

All spaces measuring over 1,000 square feet will be charged for at the rate of 10 cents per square foot.

Here is a description of the building in which the exhibition will be held:

The main building will be rectangular, having a length on Foster Street of 283 feet and a breadth of 160 feet, extending from Foster Street to Lancaster Avenue on Thirty-second Street, and part of the distance from Foster Street to Lancaster Avenue on Thirty-third Street. A tower sixty feet high will be situated at each of the four corners of this building. One central arch of 100 feet span and 200 feet in length, of the Gothic style of architecture, will cover the greater portion of the space occupied by this building, while two smaller ones, having a span of thirty feet and running parallel to it on either side, will join the towers. The building will have second-story apartments at its ends on Thirty-second and Thirty-third Streets respectively, with stairways leading up in the towers from the ground floor. The towers themselves will be three stories high. Two long and narrow hallways will afford communication between these apartments. The remainder of the ground will be enclosed by a large triangular building one story in height and joined to the main hall. The main entrance to the building will be at the corner of Thirty-second Street and Lancaster Avenue, another at Thirty-third and the avenue, and one at each of the other towers. Five exits are provided for on the plans, but desirable changes may hereafter be made in the number and situation of both entrances and exits before the work is completed.

"The meeting of the American Association for the Advancement of Science, which will be held this year in Philadelphia, and the expected presence of many representatives of the British Association, which will meet this year in Montreal, will," says the committee, "attract a numerous and influential

scientific gathering in Philadelphia during the time of the holding of the exhibition; and in order that so exceptional an opportunity to promote the interests of science shall not be lost, Congress has been requested to authorize the holding of a National Conference of Electricians, to convene in Philadelphia at this time. Should Congress, in its wisdom, make the proper provisions for holding such a conference, the results promise to be of much value.

"The scientific character and importance of the exhibition have been duly appreciated by the United States Government, and the following official letter issued by the Department of State, conveying instructions to our diplomatic officials abroad, is at once as complete an endorsement of the project as could be given, and a flattering tribute to the reputation and usefulness of the Franklin Institute."

[COPY.]

DEPARTMENT OF STATE, WASHINGTON, March 1, 1884.

SIR: I transmit herewith printed copies of a circular issued by the Franklin Institute of the State of Pennsylvania, respecting an International Electrical Exhibition to be held at Philadelphia from September 2d to October 11th, 1884.

Although the exhibition will be organized and conducted apart from the immediate control of the United States, the advantages for useful results, which a direction by the Franklin Institute confers, have been distinctly recognized by Congress. The joint resolution of February 26th, 1883, extended the privilege of "free entry" to all articles from abroad which shall be intended and used for the purpose of the exhibition, and precise instructions have in consequence been formulated for the guidance of customs officers.

It is likewise proper that the offices of our representatives abroad should be engaged in the same interest to the extent of bringing the project officially to the attention of the governments to which they are respectively accredited, and, by all suitable methods, of making known to individuals who are or might be interested, the character, standing, and profession of the exhibition above designated.

With the object of obtaining from you the service just indicated, this instruction is addressed.

I am, sir, your obedient servant,

(Signed) FRED'K T. FRELINGHUYSEN.

The committee say: "A comprehensive scheme of classification has been carefully elaborated; a system of rules and regulations to govern the internal management of the exhibition has been adopted; provisions have been made in the interest of intending foreign exhibitors, to relieve them of all trouble in respect to the passage of their exhibits through the Custom House, and for the proper reception and care-taking of the same on their arrival; and arrangements have been made with a number of the leading transportation companies to return, free of charge, goods on which freight charges have been paid one way.

"The above information, expressed in detail, has been published in the form of a twelve-page pamphlet, which, with a blank form of application for space, has been issued in the English, French, and German languages, and extensively circulated in the United States and throughout Europe.

"There are evidences at this time, even, to indicate that the exhibition will be one of unusual interest and value. The active participation of several of the scientific bureaux of the United States Government and of all the leading electrical companies is assured. Numerous inquiries both from official and private sources have been received from abroad, and interesting and valuable contributions from European countries are confidently anticipated."

Electrical Possibilities, Prospects, and Purposes.

Mr. Edison says that he is often asked in regard to the probable progress of electricity in the future, what it is likely to do, and what may be done with it. One answer really comprehends all. I believe that in time it will be the almost universal form in which energy or power will be used.

All who are interested in electrical science have a certain stock of questions which are asked over and over again whenever an opportunity presents itself. I have made a small collection of those oftenest propounded, and will here answer some of them.

One asks: "Will electricity be the universal beast of burden of the future? Will it carry us and our parcels, hew our wood, draw our water, cut our grain, cook our food, heat and light our houses, as well as furnish the motive power for our mills and factories?" This beneficent result will, I think, be attained when electrical science has reached the point when electricity can be produced directly from the oxydation of combustibles, instead of interpolating a boiler and steam engine in the process.

Prof. Tice defines electricity as the soul of the universe, the vital element of all moving matter; and I am asked if I am of the same opinion. I believe it is merely one form of motion, and the highest yet discovered.

Hon. S. S. Cox is quoted as having said that in the future, perhaps, no other agent of locomotion, heat, light, or power will be resorted to. This opinion is well founded, and is shared by all who have given studious thought to the possibilities of electrical science.

As to the changes which will be effected by electricity within fifty years in the city of New York, I would say that I believe electricity will propel the cars of the street and elevated railroads, light the city within and without its buildings, furnish power for all its purposes, work telephones and burglar alarms, deliver the opera, convey parcels, detect and signal fires, operate fire engines, and possibly displace animal locomotion for vehicles.

"The expression, 'storing electricity,' is in common use," says one. "Is such a thing possible?" In point of fact, it is done every day, although as yet not economically enough to warrant its introduction as a commercial undertaking.

Another wants to know if the sun is not the indirect source of all the electricity in the world, or even in the universe. The sun, of course, is the source of all energy in our comparatively small planetary system. This energy takes various forms, one of which we call electricity.

The question I am oftenest asked is, "Can electric appliances for light, heat, and power ever be sufficiently cheapened to become available to the poor?" This stage of electrical development has already been reached in light and power. Electricity will prove itself a boon to the poor by breaking up aggregated industries. This, I believe, will be its greatest mission. It will subdivide power so that each operator can have his own, at a trifling cost, to do what he pleases with.

"Will it ever be as useful to the farmer as to the manufacturer?" some one asks. I think not—at least, not soon—though it may be.

Electric Light Memorial.

The following testimonial, from all the principal business men of Boston, shows quite plainly their appreciation of the electrical light:

To His Honor the Mayor and the Honorable Council of the city of Boston:

Whereas, it has been represented in the public press that it is the intention of the Committee on Lamps of the Board of Aldermen to remove electric lights from the streets and public grounds of this city, and to replace them with large gas lamps burning from 30 to 100 feet per hour each; and

Whereas, your memorialists are convinced that the electric lights have proved themselves necessary for the protection of the persons and property of citizens, and that they afford the necessary amount of illumination at a lower price than it can be furnished by gas; and

Whereas, the streets of this city were never adequately lighted until the introduction of electric lamps; and

Whereas, it is evident that the introduction of the electric light has greatly benefited the city and the people at large by causing a great reduction in the price of gas; and

Whereas, the police department has borne testimony to the value of the brilliant illumination which only electricity can give, as an aid in preventing crime against persons and property; and

Whereas, the plan said to be contemplated will result in greatly lessening the amount of illumination, with little or no decrease of expense;

Therefore, your memorialists pray that the appropriation of $94,000 for electric lighting, as set down in the estimate submitted to your honorable body for the lamp department in the auditor's estimates for the current year, be increased to $125,000, and that the Lamp Committee be instructed to increase the number of electric lights in this city to correspond with this estimate, and that a proportionate increase in the number of electric lights on the Common and other public grounds be included in said increase.

Shepard, Norwell & Co.,	Henry M. Burr,
Chandler & Co.,	Messenger Bros. & Jones
Lewis Brown & Co.,	Thos. F. Doherty & Co.,
Jackson, Mandell & Daniell,	Moulton, Terry & C.,
Claflin, Larrabee & Co.,	Barnes, Ward & Co.,
Charles A. Smith & Co.,	Thomas I. Kelly & Co.,
Frederick W. Nickerson,	Puffer, Sanborn & Co.,
Charles W. Seabury,	Geo. W. Simmons & Co.,
Tilton, Townsend & Dorr,	Charles H. North & Co.,
Leland, Rice & Co.,	A. S. Brown,
Hawley, Folsom & Martin,	D. J. A. Tully & Co.,
Hall Rubber Company,	Charles E. Mudge,
Chandler & Farquhar,	Henry Sherwin,
Cushing & Bliss,	Phelps Bros. & Co.,
Joseph F. Paul,	Franklin, Rolfe & Co.,
Henry Poor & Son,	Parker & Wood,
Isaac Fenno & Co.,	Jno. L. Stevenson & Co.,
Plympton, Fisk & Co.,	Lowell Bros. & Co.,
Thomas Mack,	Stapleton & Denning,
Miner, Beal & Co.,	Richard Briggs,
Rufus S. Frost & Co.,	W. B. Clarke & Carruth,
Bonice, Daniels & Gross,	Theodore N. Vail,
Dyer, Taylor & Co.,	W. A. Ingham,
Wheeler, Conant & Blodgett,	Charles W. Slack,
Farley, Harvey & Co.,	Griswold, Whitney & Co.,
E. W. Wheelock & Co.,	Hyde, Wheeler & Co.,
J. H. Hecht,	Blanchard, Farrar & Co.,
Henry C. Morse,	Cobb, Bates & Yerxa,
Woods, Perry & Co.,	John P. Lovell & Sons,
Chamberlain & Currie,	Niles Bros.,
John P. Squire,	Joseph Squire & Co.,

and one hundred and fifty others.

The Ball Electric Light.

The Reading (Pa.) *Times* says that the other day we incidentally discovered the existence of an electric light system which we had not before heard of, but which we are inclined to believe will be a formidable and successful competitor with the best of the systems now in use. It is the Ball Unipolar Dynamo and Arc Lamp, the invention of Mr. Charles E. Ball, of Philadelphia, whose patents are controlled by Henry Spang, of Reading. Dropping in at the Goodwyn Meter Works, in Philadelphia, to look at the Clerk Gas engine (a Scottish invention about being introduced in this country as a rival to the Otto Gas engine), we found one of these engines driving a small electric light plant of five arc lamps. Noticing that both dynamo and lamps were essentially different in construction from any other we had seen, closer examination satisfied us that Mr. Ball has scored several points on his older competitors.

We learn from Mr. Spang that important improvements are constantly being made at their experimental shop in New York, and he is confident that the Ball Unipolar system will take the lead in electric lighting, motive power, etc. He has deemed it best to move slow and sure in the matter, so as to be satisfied that every machine turned out will be a success. He has not, up to this time, encouraged the general introduction of incandescent lighting, for the reason that the lamps are too fragile and the carbon filaments are too easily broken and burnt.

Important improvements are, however, being made in incandescent lamps, and also in arc carbons, and he hopes during the coming summer or fall to bring a general system of incandescent, as well as arc lighting, which he claims will even surpass the present Edison system.

Every Ball Unipolar dynamo now in use is giving excellent satisfaction, and orders for it are coming in unsolicited.

The Ball dynamo at McIlvain's rolling mill is operating seven Ball arc lamps about this mill, and the light given is pronounced the best in the city. It also operates six Gatehouse (not Edison, as previously reported,) incandescent lamps, in their office. Mr. Spang reports that the said machine has all the armatures and field magnets connected in one circuit for arc lighting, and is therefore not properly adapted for incandescent lighting on account of the intense current generated, although it manages to also operate the incandescent lights named.

A different arrangement of armatures and field magnets is required for exclusive incandescent lighting, and also for arc and incandescent lighting at the same time from the same machine.

A Ball dynamo having one armature and all the field magnets connected in one circuit and the other armature in an independent circuit, has been in operation at the Clark Insulated Wire Works at Bristol, Pa., for some months past, operating eleven arc lamps in connection with one armature and about forty incandescent lamps in connection with the other armature, and has thus far proved itself to be the only practical dynamo which can produce both arc and incandescent lighting at the same time and in a satisfactory manner.

A Remarkable System of Electric Lighting.

The Boston *Traveller* says that in the issue of *Science*, of February 15th, is an article reviewing the tests of the different systems of electric lighting made at the Cincinnati Exposition.

The article gives some interesting facts concerning the value of the Thomson-Houston apparatus, which has recently been brought so prominently before the public on account of its great simplicity and originality.

By means of a very ingenious and perfectly automatic system of regulation in connection with many other valuable features, wholly confined to this system, electric lighting is reduced to a point of the greatest efficiency and economy. In respect to every feature of commercial value it has far outstripped all its rivals, and the economy of operating it is such that very many local companies using other systems have found it to their advantage to discard their old apparatus altogether and install that constructed under the Thomson-Houston patents.

Prior to Jan. 1st, 1883, by reason of unfortunate management, and in consequence of attempts of two rival companies to secure control of its valuable patents, its system had not been generally introduced.

The present management, however, taking charge of its affairs a little more than a year ago, immediately adopted measures to bring its merits to public attention, and submitted it to several competitive tests with other old and well-established systems. In every case the Thomson-Houston was triumphant, and was awarded the first prize, not only by electrical experts but by those appointed to report upon its mechanical and commercial features.

Early in the year there was an exhaustive test at Quincy, Ill., in which committees of prominent experts and mechanics, after comparing it with other well known systems, gave a most unqualified award to this for every feature of commercial value.

At the great Industrial Exhibition at Cincinnati, referred to above, it received the first prize for best arc light.

The company, having been kept busy through the very successful operations of its New England agents, the American Electric and Illuminating Company, which has done almost phenomenal business in the establishment of local companies, is preparing to extend its operations over a wider extent of country and to the Pacific coast.

It has recently removed its manufacturing establishment from New Britain, Connecticut, to a large new factory at Lynn, where it has largely increased facilities for furnishing apparatus. We may have occasion to refer more in detail to the operations of the Thomson-Houston Company at a later date.

One advantage of electric railways will be that we shall have good conductors.

The Calcutta International Exhibition, 1883-84.

GREAT SUCCESS OF THE EAST INDIAN EXPOSITION—ORIGIN AND PROGRESS.

Our correspondent at Calcutta sends us the following interesting description of the great exposition now in progress there:

After the close of the Exhibition held at Christ Church, New Zealand, in 1882, M. Joubert, together with a few of the exhibitors at that Exhibition, including Mr Scott, Commissioner for South Australia, and Mr. Dilworth, the present Commissioner for Great Britain, had a discussion as to the feasibility of holding an International Exhibition, on a large scale, at Calcutta. The idea was adopted as a good one, and steps were immediately taken to insure its success. Mr. Scott started for Australia, where the scheme was taken up by all the Colonies with an avidity, the result of which is the important position held, and the successful display made by our Australian Colonies. We shall deal fully with the Australian Courts later on, but we may here mention that the various Governments cordially gave their support to the scheme, and the following sums were sanctioned by Parliament in furtherance of the objects in view:

For New South Wales	36,000	rupees.
Victoria	66,000	"
South Australia	36,000	"
Tasmania	24,000	"

Nor was Mr. Dilworth less successful, for within a few months—some eight or nine, we believe—he, as official agent for Great Britain, had secured the co-operation of a very large number of English firms, while in addition to this powerful support, the mercantile community of Great Britain, generally, came forward with their wonted enterprise to swell the ranks of exhibitors.

In the meantime M. Joubert had come on to Calcutta to discuss the project with the Lieutenant-Governor of Bengal. It was, at first, his intention to take upon himself the whole responsibility of the speculation—for in that light he looked upon the scheme—asking only the patronage of the Government and a free grant of space on the maidan for the erection of the necessary buildings. Further enquiry as to the attendant difficulties, however, induced M. Joubert to turn to Government for official support.

The sanction of the Government of India having been obtained for the Bengal Government to assist M. Joubert to hold an International Exhibition in Calcutta, the advice of the Government of India was solicited as to the best means of securing the support and co-operation of the other governments and administrations. Mr. Buck, Secretary to the Government of India in the Revenue and Agricultural Department, was invited by His Honor, the Lieutenant-Governor, to undertake the organization of the Indian section, and to secure the assistance of the local Governments for this purpose. Mr. Buck offered to procure the magnificent collection now on view in the Indian Courts for the moderate sum of 50,000 rupees. This he divided into two portions, about 30,000 rupees being devoted to art wares, and the remainder to raw products and rough manufactures, and to defray the working expenses. Mr. Buck, in dealing with the local Governments in the name of the Government of India, invited them to devote sums from their local revenues, and offered to give, on an average, 5,000 rupees to each Government on condition that they would, in their turn, contribute a like sum. They not only complied with the request, but, in most instances, more than doubled the sums voted to them by Mr. Buck, and also lent their aid to induce local manufacturers to send on loan large collections of their wares. The result is that we have now on view a collection of Indian wares and products, the value of which must be little short of 5,000,000 rupees.

In addition to the important aid afforded by Government above referred to, we must not forget to mention that the work of construction has been entirely carried out by Government officials. To Col. Trevor, R.E., of the Public Works Department, Bengal, and his indefatigable subordinates the credit must, in this respect, be given. Of the valuable work done by Dr. G. Watts, another Government official, placed on special duty in connection with this Exhibition, we shall speak later on when treating of the Economic Court, with which his work is principally identified.

We may close this introduction by saying that from the time the idea of holding an International Exhibition at Calcutta was first mooted in New Zealand in 1882, until the day of the opening ceremony, December 4th, 1883, the scheme has been pushed forward with a vigor as remarkable as successful both by the promoter and the body of able men deputed to carry out their wishes by the Governments of India and Bengal.

The inaugural ceremony, which took place on the 4th of December, was unfortunately somewhat marred by the rain, which fell incessantly throughout the proceedings. Notwithstanding this drawback, however, the grand quadrangle in which the ceremony was performed presented a lively appearance, and was fairly, although not uncomfortably, crowded long before the Viceregal party arrived. The large square was gaily decorated with flags and banners, bearing various devices, while over the whole Court a gaily colored canopy was suspended, which, although it failed to keep out the rain which came through with a steady persistency that would not be denied, added very materially to the general effect. The electrical installations are excellent and excite a great deal of admiration and I think that the speedy introduction of the arc and incandescent systems are both insured. I shall note some further matters of interest in my next letter.

THE CALCUTTA INTERNATIONAL EXHIBITION 1883-4

Electric Roads in London.

PRACTICAL APPLICATION OF ELECTRICITY TO RAILROADS.

The *Times* says that what the rapid transit commissioners are doing in the laying out of cable roads in this city is being done in London with electricity as the motive power, and soon that city will be a net-work of rapid transit electric railways. Attempts in this country to substitute electric railroads have not as yet got beyond the period of promises, stock-jobbery and speculation. The success of the Brighton Electric Railroad has stirred up general interest in London, and the work of building similar ones is rapidly progressing. The Brighton Road extension will be opened at the end of this month. The short road was operated from August 2, last year, to January 4 last, and in that time 30,000 passengers were carried. This road only ran from the aquarium to the chain pier, and had a gauge of 2 feet. A Siemens motor was used, run by an Otto gas-engine of 2-horse-power. The car was small, and only carried 10 passengers. In order to continue the road a mile further on, it was decided by the operating company to relay the track with a new 2-foot 9-inch gauge. This has been done, and the road is to be opened in a few days. As before, a Siemens dynamo will furnish the current, and the dynamo will be run by an Otto gas-engine of increased power. The generator and engine are to be situated under the sea-wall in a vault. During the time of the road's operation last fall there was not a day that it did not pay a profit.

Work is now being rapidly pushed on the Charing Cross and Waterloo Road, which will run from the Waterloo Station of the London and Southwestern Railway to Charing Cross, a distance of five furlongs and two chains. The capital of this road is £100,000, or 10,000 shares of £10 each, and the company can only use electricity as the motive power. The road passes under the Thames in a tunnel which is now being dug. This work, with that of the underpinning necessary along the line, makes it a difficult piece of engineering, but it will be finished as soon as possible. The Siemens have taken a contract to operate the road for a year. A third company, with a capital of £500,000, has laid out four new routes of electric railroads. These routes are from St. Martins-in-the Fields to St. Giles in the Fields, 3 furlongs 7.4 chains in length, from Piccadilly to St. James, from St. Giles to Newgate, and from Newgate to St. Michaels. These roads are to be fitted up with handsome cars, and the Siemens dynamos will furnish the current.

The Question of Cost.

The question of economy seems to be the point on which street lighting by electricity or gas largely depends. Let us, for argument, consider the question of retaining the electric lights solely on the basis of cost—dollars and cents paid for precisely the same article—aside from the manifold advantages conceded the electric light as an illuminant for the public streets and as a guardian of the public safety. In the report of the superintendent of lamps of the city of Boston the official figures give the cost for maintaining five large gas lamps in Temple place (including one at the corner of Tremont street, as $546.50. Only two of the five lights burn all night. Should the five be burned all night, the annual cost would be $746.45. I claim that two electric lights, one placed, say 100 feet from Tremont street, on the upper side of Temple place, and one placed about the same distance from Washington street, on the opposite side, would light that thoroughfare much better than the five gas lamps costing $546.50. The cost for two electric lights would be $474.50, and, furthermore, they would burn *all night*, which, as I have said, is not the case at present and is a great desideratum.

Boston, March 22, 1884. C. S. G.

"Lucy,' said one South Side girl to another last night, "somebody wants to speak to you over the telephone."

"Is it a gentleman or a lady?"

"A gentleman."

"O dear! you answer him."

"Why, he wants to speak to you."

"I wouldn't dare to talk through the telephone to-night; you know I've been eating onions. I'll step into the back yard and you can tell him I'm out."

ELECTRICAL AND SCIENTIFIC

The Eastern Imperial Electric Light Company's certificate of incorporation was filed. It has a capital stock of $500,000, divided into 5,000 shares of $100 each. The incorporators, who are also the trustees for the first year, are Eleazer B. Loring, Wm. F. Pepper, and George C. Wilde.

A certificate incorporating the Globe Electric and Underground Conduit Company was filed last Thursday in the County Clerk's office. The corporators are John M. Walsh, Geo. R. Curnamond, Charles Reynolds Logan, J. Clayton Erb, and Wm. D. Neilson. The company's capital stock is $2,000,000, divided into 200,000 shares of $10 each. The operations of the company are to be carried on in this and other cities. The trustees are William D. Neilson, Francis Martin, and Albert E. Schaible.

The Standard Oil Company, which has now a controlling interest in the New York Steam Company, proposes to introduce the Parker electric light system in this city, having concluded negotiations with the Parker Company, of Little Falls, through the Steam Company. Stockholders of the Steam Company have also organized the New York and Brooklyn Electric Light Company, and purchased an interest in the Sawyer-Man system.

The Twelfth Cincinnati Industrial Exhibition of Industry and Art to be held from September 3d to October 4th, 1884, will give quite prominent place to things electrical. In the Exposition circular now before us, we find (Department F. Clause 72): "Industrial applications of electricity, telegraphic and telephonic apparatus, electric motors, electric lighting and signaling apparatus, dynamo electric machines, electro-plating apparatus."

An international competition is invited by the Second Teyler Society of Haarlem for a gold medal worth 400 florins, for a critical study of all that has been said for and against spontaneous generation, especially during the last 25 years. Details may be had by application to "La Maison de la Foundation du feu M. P. Teyler van der Huist, Haarlem."

A report has been communicated to the Academy of Sciences, Paris, by the French Minister of the Postal and Telegraph Department, on the thunder storms which visited France during the first six months of last year. From the full and detailed tables it is learned that in all there were 9 persons and 78 animals killed, and about 50 persons and 7 animals injured by lightning.

The Bank of England is lighted with 150 Swan high-tension incandescent lamps. A horizontal portable engine drives the dynamo-electric machine, of an electro-motive force of 120 volts and a current of 60 ampères, which charges a 55-cell Faure-Sellon-Volkmar battery to supply the lamps. An Anderson patent magnetic safety cut-off is introduced to prevent, automatically, excess of current.

Lewiston and Auburn, Me., have Electric Lights.

LEWISTON, March 26.—After a practical test, the Lewiston and Auburn Electric Lighting Company have purchased from the American Illuminating Company all its rights and privileges in the twin cities. About 100 lights are now being burned here, with much satisfaction. Hon. George C. Wing, chairman of the Republican State Committee, has been chosen president of the board of directors.

A New Cambridge Company.

The Cambridge and Somerville Electric Light Company are in the field, and their prospectus has been issued to the public. The latter presents a strong case, and their appeal to the public is already stated. It is proposed to get in operation a plant of one hundred arc lights as soon as practicable, and have a general distribution of them through Cambridge, Somerville, Watertown and Arlington, Massachusetts. When the stock subscriptions are completed, and contracts for light signed, the management will forthwith proceed to put in their plant and operate it. This plan of introducing the electric light to a community is a novel one, and deserves the attention of the public and electric light companies throughout the country. The scheme is based upon what is termed true business ethics, and, when fully carried out, will prove extremely beneficial to the local stockholders, as well as those interested in promoting and forwarding the project. The capital of the Cambridge and Somerville Company is also wisely put at a low figure—$75,000; 750 shares, at $100 each; and every share should command the full price asked, from the fact that there seems to be no inflation anywhere. On the contrary, the basis of their organization is excellent, and wisely carried-out plans should give Cambridge and the surrounding towns a company managed upon business principles. The company is incorporated under Massachusetts laws, and have secured rights to prosecute a "general electric lighting, heating and power business; that is to say, the business of producing, using and supplying light, heat and power generated by means of electricity, and to do all things necessary and incidental to the prosecution of said business."

The Board of Directors are: Ex-Mayor Saml. L. Montague, President; Senator Henry H. Gilmore, Vice-President; Ex-Senator Leander M. Hammon, Treasurer; Councilman Edgar R. Champlin, Secretary; Mr. Samuel Elder, General Manager, and Mr. Henry E. Irvine.

The two last-named gentlemen are well known to the electrical world through their connection with the American Electrical and Illuminating Company, of Boston, and their practical experience in the business must add greatly to the successful working of this new enterprise.

The Thomson-Houston system of electric lighting, to be used by this company, is undoubtedly one of the best in the field to-day. Its recognition as one of the leading systems is now felt and known throughout the world.

The recording of impressions given by light and sound opens the door of a strangely novel world to us. The latter is especially weird. Living thoughts are impressed on inanimate material. Phonography is as yet in its childhood. Some day the proclamation of closet whispers will be realized with an ease which will abolish privacy. A secret, silent instrument, disguised as a parcel, footstool or book, will note and keep the record of every word spoken in the chamber where it is laid. The debates in Parliament will be intrusted to a machine, and, instead of turning to a page of Hansard, the inquirer will press a button and cause the redeliverance of the speech itself out of a platinum throat. The most popular of future inventions would, for a time at least, be an "electroscope." By the aid of this distant scenes would be summoned to the eye, and club idlers be enabled to watch the progress of remote battles in the ease of the smoking room. Instead of maps with colored tin flags, shifted each day as the wire brings intelligence of the campaign, they would see the meeting of the very armies themselves. The sheets representing this would be laid upon a table or hung up in the hall. Then men might glance at it, as they do at the telegrams during a debate, and note how the fight went two or three thousand miles away. We have at present, however, got no further than the fact that if the mouth of a telephone were opened on a distant field of battle we could hear it going on, and probably discern some screams of the wounded in its din, as we sit far away by the peaceful fire of home. —*Leisure Hour.*

Ericsson's Solar Engine.

Nature (London) illustrates Ericsson's sun motor, and describes it as follows:

"The bottom of the rectangular trough consists of straight wooden staves, supported by iron ribs of parabolic curvature secured to the sides of the trough. On these staves the reflecting plates, consisting of flat window glass silvered on the under side, are fastened. It will be readily understood that the method thus adopted for concentrating the radiant heat does not call for a structure of great accuracy, provided the wooden staves are secured to the iron ribs in such a position that the silvered plates attached to the same reflect the solar rays towards the heater. The trough, 11 feet long and 16 feet broad, including a parallel opening in the bottom, 12 inches wide, is sustained by a light truss attached to each end; the heater being supported by vertical plates secured to the truss. The heater is 6¼ inches in diameter, 11 feet long, exposing 130×9.8=1274 superficial inches to the action of the reflected solar rays. The reflecting plates, each 3 inches wide, and 26 inches long, intercept a sunbeam 120×80=23,400 square inches section. The trough is supported by a central pivot, round which it revolves. The change of inclination is effected by means of a horizontal axle, the entire mass being so accurately balanced that a pull of five pounds applied at the extremity enables a person to change the inclination, or cause the whole to revolve. A single revolution of the motive engine develops more power than needed to turn the trough and regulate its inclination so as to face the sun during a day's operation. The motor is a steam engine, the working cylinder being six inches in diameter, with eight inches stroke. The piston rod, passing through the bottom of the cylinder, operates a force pump of five inches diameter. By means of an ordinary crosshead secured to the piston rod below the steam cylinder, and by ordinary connecting rods, motion is imparted to a crank shaft and fly-wheel applied at the top of the engine frame, the object of this arrangement being that of showing the capability of the engine to work either pumps or mills. The average speed of the engine during the trials last summer was 120 turns per minute, the absolute pressure on the working pistons being thirty-five pounds per square inch. The steam was worked expansively in the ration of one to three, with a nearly perfect vacuum kept up in the condenser inclosed in the pedestal which supports the engine frame."

A Boston contemporary says of electricity, that the age of steam is being supplanted by the age of electricity. It conveys intelligence, it furnishes light, and that it can and will be applied as a motive power we have little doubt. The only difficulty appears to us to be in collecting the electricity in a sufficient quantity, and controlling its action after it is collected. We see no reason why it should not become a motive power in the hands of man—it is *the* motive power in the hands of God. It is that power by which the whole planetary system is upheld and governed, keeping each orb in its prescribed place, giving to it its diurnal and annual motions, producing the seasons, and communicating both light and heat. Indeed, if we were to say that it is physical life, acting in subordination to the spiritual life which is within us, we might not be far astray. It is certain that it pervades all things, and is essential to animal and vegetable existence.

Being, then, necessary to the existence of life—being, under Deity, the animating principle in all things, holding the millions of globes poised in space, and moving by fixed laws which it has impressed, rendering these globes the fitting habitation for intelligent beings—it need not excite surprise if it be finally made subservient to man in his common avocations; if it not only move his ships, his railroad cars and his machinery used in mechanical business, as it is now applied to lighting his cities and giving him perpetual daylight, if he so desire.

It is inexhaustible, and therefore can perform its functions without waste of material. It is perpetual and invariable in its action upon the various planets, and we have only to discover a mode of collecting and controlling it to make it useful to man in all his complicated relations. When this discovery has been made, then shall we have a great revolution in science and mechanics, and a road will be opened to new discoveries, which has heretofore been closed to us.

OPPOSITION TO THE PROPOSED RETURN TO GAS IN SOUTH BOSTON.

The proposed intention of the committee of the city government, having charge of the lighting of the streets, to substitute gas on the alleged plea of economy, in numerous localities now illuminated by the electric light, has awakened a public interest in the matter which conclusively shows with what favor the electric lights have been received, and the opposition that would be made to any change. It has been thought best by the committee to first make the change in South Boston, and to reduce the sixty-five electric lights now in use in that locality to sixteen, the remaining fifty to be replaced with gas lights, burning four and five feet per hour, and to locate five large gas lamps, consuming thirty feet per hour, at the junction of crowded thoroughfares. A canvass made by a *Traveller* representative among the prominent residents of South Boston reveals an almost universal sentiment in favor of the continuance of the electric light. Among those who expressed an opinion were many business men and professional gentlemen, who unhesitatingly favor the continuance of the new system on account of the many advantages of its use. In the city proper, where the electric lights have been placed in dangerous localities, the crowds of loafers that formerly congregated in those places, to the annoyance of passers-by, and oftentimes danger to life, have been dispersed by "too much light." This is particularly an advantage to suburban residents who take late trains to their homes from the western and southern depots. As regards electric lights for bridges, Mr. N. E. Story, superintendent of the Prison Point Bridge, in the *Herald*, says: "As bridge lights they have no equal, for I can safely travel from one place to another as well and as quickly as in daylight. In cases of drowning, or rescue from or locating the exact spot of the person in the water, it is of the greatest value. Many persons have been drowned and assaulted in the vicinity of Prison Point Bridge and their outcries been heard, but it was so dark nothing could be seen. When three electric lights would light the street from the old prison to Craigie Bridge, their advantage to the public generally is as the gas-lights to the old-fashioned oil lamps forty years ago, and I hope to see them on Prison Point Bridge, and every place where needful."

A German technical journal gives the following method of producing a bronze-like surface on iron or steel, which prevents rust: The object to be acted upon must be cleaned so as to take off all oxidation or other impurity. It is then exposed for two or three minutes to the action of the vapors of a heated mixture of hydrochloric acid and nitric acid in equal portions, at a temperature ranging from 550 to 650 degrees Fahr. After the objects have cooled, they are to be rubbed over with vaseline, and again heated until the vaseline begins to decompose. This treatment with the vaseline has to be repeated once. Should a lighter coloring than bronze be desired, it can be produced by mixing acetic acid with the other acids.

The Chapman Electric Motor Company also filed its certificate of incorporation, the corporators being Siegmund F. Meyer, Asher T. Meyer, Charles C. Peck, Wm. H. Chapman, and Philip L. Meyer. The company has a capital of $500,000, divided into 5,000 shares of $100 each.

Gas Against Electricity.

SENTIMENTS OF TAX-PAYERS AND CITIZENS ON THE MATTER.

In view of the proposed change in lighting South Boston, a representative of the *Traveller* called on the Superintendent of Lamps, Mr. Hugh J. Toland, at City Hall, and was courteously shown the contemplated plan for reducing the number of electric lights. The change is indicated by four sizes of pins on a map. Sixty-five electric lights are in use in South Boston at the present time. Of this number sixteen are to remain, while fifty will be replaced by gas lamps. The Committee on Lamps propose to light the whole of Broadway with gas lamps, to consume five feet per hour; Fourth street from A street to Dorchester street; then Dorchester street from Broadway to Dorchester avenue; I street from First street to Eighth street. The remaining portion of the peninsula is to be lighted with gas lights consuming four feet per hour. In addition to these it is the intention of the committee to locate five large gas lights to consume thirty feet per hour, as follows:

One at the crossing or the New York & New England railroad on A street at Boston wharf; one is to take the place of the electric lamp on Dorchester avenue at the foot of First street; one at the corner of Dorchester avenue and West Fourth street; one at the corner of Dorchester avenue and West Fifth street, and one at the corner of Dorchester and Telegraph streets. The committee further intends to take all electric lights out of Independence square and Thomas park and replace with gas lights, with a view of furnishing a better street lighting service

AT LESS EXPENSE TO THE CITY.

South Boston is an important arm of the city, with 70,000 inhabitants, and has several heavy taxpayers. It is not proposed to relinquish electric lights for gas without a strong protest.

In order to ascertain the sentiments of taxpayers and citizens in regard to the plan, the following gentlemen were questioned by a *Traveller* representative, and the subjoined expressions were given:

Councilman Lappen said: I favor the electric lights decidedly, and the more the better tendency to decrease crime. I prefer the electric light to gas, and my only regret is that we have not an electric light on every prominent corner all over the peninsula. I don't think the tax-payers of South Boston would object to pay the difference. To leave us only sixteen would be but a drop in the bucket.

A professional gentleman gave his opinion that the electric lights should not be abolished but regulated, and should be placed in lonely thoroughfares, and where stores were few. Life and property are better protected by electric lights than the free use of gas.

Mr. Henry Souther said the electric lights are very pretty and very expensive. They have advantages and disadvantages.

Councilman George H. Bond said the electric lights are the best protection to life and property that can be given in South Boston. Places heretofore infested with street loafers, are free from that nuisance to-day. I am of opinion that a petition to retain the electric lights would receive the endorsement of nearly all the tax-payers and citizens, and as far as the increase of the expense to be incurred, I would be more willing to bear it for that purpose than any other outlay I know of. When the dispensing with the electric lights is contemplated a monster petition will be sent to City Hall

AGAINST THE PROPOSED CHANGE.

Mr. S. A. Woods was of the opinion that a reasonable number of electric lights should be judiciously dispensed at prominent crossings and squares, as they could be placed to better advantage than at the present time. At the street crossings there should be three gas burners instead of one.

Mr. A. M. Stetson said it is totally unnecessary to have any of the parks lighted after the 1st of October until the 1st of April, as they are not to be considered as thoroughfares. On account of the beautiful effect, as well as the practical results of electric lights, they should be retained to a certain extent and be placed on prominent corners and at junctions. In all cases it would not do to rely on electric lights till more improvements are made, as they have gone out frequently at night. The telephones and electric wires should be protected against contact with those of the electric light, and the wires should be laid underground in some way not to be influenced by storms. Gas should be an auxiliary to the electric light. I consider the electric light a luxury, and say by all means let us have it.

A business man of South Boston said there is not any too much light, and now that the public are educated to it, it will not be satisfied without it.

Mr. W. H. H. Flynn said he would be sorry to see the electric lights removed. In this advancing age it would be retrograding to decrease it. In a very short time the system would be so developed that all the disadvantages would be overcome, and as inventive men make new discoveries the expense would become less. The city should place two or three electric lights between the Old Colony Railroad crossing and Dorchester street. The city is advancing all the time, and the world looks to Boston to take the lead.

IT PAYS THE CITY TO HAVE GOOD LIGHTS.

Mr. Vincent Laforme said he favored gas lighting in preference to electric lighting not only for economy but for general use, the former being more reliable than the latter.

Mr. Thompson Baxter has not given the subject much attention, but is favorably inclined to the electric lights being retained—some of them at least, and those particularly in the more conspicuous places.

Ex-Councilman A. F. Lanten, said for the prevention of crime the electric lights were an auxiliary to the police. The electric light has been one of the best preventtives against crime, and there are less obstructions on the sidewalks than by the use of oil or gas.

Judge Burbank, of the South Boston Municipal Court, said there is less crime committed in light than in darkness.

A gentleman who is confined to his house, located on a corner, and who can look upon several streets and see the different kinds of lights, said: I notice that the electric light frequently goes out without any apparent cause, and if the same amount was expended for gas as for electric light the city would be better served.

Dr. J. Sherman said he thought we had much better light with the electric lamps than gas, and that the additional expense is comparatively slight, and that for the same amount of light with gas the expense would be greater. There is no surety that the

PRESENT PRICE OF GAS WILL CONTINUE.

Representative Henry E. Hosley was of opinion that from an economical standpoint he should almost object to have the electric lights remain, but as a safeguard to life and property they are inestimable.

Ex-Representative Dr. A. H. Wilson said: I should regard any change in the plan for lighting South Boston, so recently inaugurated, with very great disfavor, believing that such changes can only be made at great cost, and furthermore regarding the introduction of electric light as a necessary improvement, the interest of preserving the safety of its inhabitants. Any change at the present time would, in my opinion, be hasty and unwise legislation.

Rev. James A. Sallaway considered it would be unwise to diminish the electric lights.

A gentleman acquainted with gas works said that the large lamp with three Bray burners, at the corner of Broadway and Dorchester street, consumes 30 feet of gas an hour, with an illuminating power of about 108 candles. There is a mistaken idea existing as to the candle power of the electric lights. That of an ordinary arc light is stated at 1,000 candles; but in reality it is but 250 candles, as the electric light is tested from four sides, and the sum of the four tests is given as the illuminating power. The illuminating power of gas is obtained by testing one side of a gas flame by direct comparison with a sperm candle, and the result is the actual candle power.

Dr. M. F. Gavin is perfectly willing to pay the increased cost for the electric light, in preference to gas. The electric light is much safer in case of fire, as it can be speedily cut off.

IT IS ALSO INVALUABLE TO FIREMEN.

Dr. L. D. Packard was in New York, and his views were not fully obtained; but a few days ago he said to the scribe, "These electric lights are fine for those who are out at night. Don't you think so?"

The South Boston Citizens' Association, at a meeting held Wednesday evening, resolved to memorialize the City Council not to dispense with the electric lights.

Mr. Harrison Loring said that it is for the interest of the city to light all public parks more thoroughly than they have ever been by gas. I say it is for the *best* interests of the city because I know from my own observation, and from the testimony of others, that our imperfectly lighted parks and public grounds have been found to be convenient places for immoral conduct, as they are comparatively safe places for concealment from public view. The advantages of electric lighting of our public grounds can be summed up in a few words, as follows: Safety of life, security of property, less immorality, for brilliant illumination prevents crime.

Ex-Speaker Noyes said: In my judgment it would be false economy. One electric light is worth many gaslights to illuminate our streets. And one such light is equal to a man on the police force in the night, as it enables them at night to cover a large area. Any thief may want their removal.

Rev. C. H. Spaulding said he regarded the electric lights as a great luxury and of immense value to any neighborhood in which they are located. Their removal would be an unspeakable misfortune. It is demonstrated that when rightly managed there is no hazard to human life in their use. The very rare accidents are no valid argument against them.

Dr. A. T. Davison said he would regard it a great calamity to have the electric lights removed. The dark corners and doorways formerly infested at nights by loafers are now deserted.

Dr. C. B. Belt said: I enjoy the electric light and consider it an excellent thing, especially placed in places where loafers were accustomed to congregate.

Lighting Cities by Electricity.

Mr. Leonard Henkle writes as follows:

"On the 9th of this month the New York *Tribune* stated the yearly cost of lighting the City of New York to be 'seven million dollars,' giving Thomas A. Edison as its authority for making the statement. The Buffalo *Express* and some other papers reproduced the article immediately thereafter, upon the ground that the figures given by Mr. Edison were correct. Mr. Edison ought to know the cost of lighting New York, as he was among the first to place electric light in competition with gas in that city.

"I am glad, however, that these papers were so ready to publish the statement, and that they and Mr. Edison gave it out to the public, instead of me, because it will readily appear, and reasonably, too, that every gas Co. now in operation, will combine to oppose me with relentless fury in my attempt to bring the electric light down to the present price of gas, and even lower, when my plans are fully consummated, and that every possible means will be used to throw my statements into discredit, to prevent capitalists from assisting to carry out my plans. On the part of these companies, and every newspaper subsidized by them, there is every motive for opposing and none for helping me, except where a desire to benefit the public by a cheaper system of lighting, or a personal knowledge of me or my plans, furnish the motive for remarks; and in the latter connection I refer with pride to the fact that none of the Rochester or Niagara Falls papers have ever made disrespectful remarks about me or my plans.

"It is evident, however, that the figures given by Mr. Edison had reference to the combined cost of every kind of lights used in New York for both public and private purposes, for I have official figures from that city giving the yearly cost of public lighting. I have also received official statements from more than fifty other cities. A few are here given:

S. McCormick, Supt. of Lamps, reports New York	$467,774 00
Wm. J. Tate, City Clerk, reports Brooklyn	324,783 40
T. J. Mahoney, Comptroller, reports Buffalo	148,559 90
Joseph Beck, Lamp Inspector, reports Jersey City	81,809 50

"Now to the basis of argument furnished by Mr. Edison and the New York *Tribune*, and they will certainly ask to be believed regarding the truth of their own statement.

"If it costs $7,000,000 yearly to light New York City, with a population of 1,206,590, we can easily determine the cost of lighting other cities and towns, for this fixes the yearly cost for each inhabitant at about $5.80.

"There are fifty-four cities and towns of note along the N. Y. Central R. R. line from Niagara Falls to New York, inclusive, with an aggregate population of 1,736,511, according to the census of 1880. Then we reach Brooklyn and Jersey City, with combined populations of 659,465, which, added to those on the line, makes a total population of 2,395,976. This number, multiplied by $5.80, amounts to the sum of $13,896,660 every year.

"It is 461 miles from Niagara Falls to New York, leaving 39 miles out of 500 for reaching Brooklyn and Jersey City and for mains in these cities and New York, enabling us to reach and command a yearly income of nearly fourteen millions of dollars by laying only 500 miles of connections—an income which, after paying all current expenses, would, in less than two years and eight months, pay for twelve acres of land at Niagara Falls, embracing improvements and views affording an annual income of about $40,000; would pay for the erection and construction of the finest buildings and most powerful and costly machinery on the globe, forever controlling the use of the greatest unvarying water-power in the world, besides laying underground connections with every city and town of note in the United States and Canada, allowing that the whole cost is $30,000,000.

"When we aggregate the population of all these cities and towns, and estimate the yearly income that would accrue, at one-half the present cost of gas, we have a sum sufficient to pay for all of which I have spoken in less than ten months, and which can be maintained forever after for less than three million dollars against an annual income of more than $40,000,000; for be it remembered that the current of electricity costs nothing, nor does the water-power to propel the machinery to transmit it, for nature furnishes both in unlimited supply and free to man.

"In connection with the figures herein contained touching only one line and source of income for showing the 'commercial practicability, I would also submit to the honest consideration of every intelligent person the overwhelming proofs daily brought out by practical tests and applications proving that the generation, induction, transmission, storage and subdivision of the current of electricity for lighting purposes is no longer a matter of experiment or doubt. Electricity is now used in nearly every city in America and Europe for lighting purposes."

MARCH 24, 1884.

Dear Sir:—Will you please inform a constant reader what varnish or paint is suitable to coat wood that is to be used in a set of cells for a bichromate battery, and oblige, yours truly, F. M. GILLEY,

Ass't Chelsea High School,
27 Marlboro st., Chelsea, Mass.

ANSWER:

Use well-seasoned wood soaked in paraffine, or paint it with a coat of asphaltum or shellac.—ED.

Telephonic News

The Metropolitan Telephone and Telegraph Company, of this city, are rebuilding their exchange at the corner of Sixth Avenue and Broadway, and putting in a new multiple switch-board. This is the second multiple board they have put in here.

Official returns of the New England Company show that 183 subscribers were added last month, and that one new exchange was established.

News from India says that the settlement of pending questions connected with the protection of the Indo-Persian Telegraph has been arranged. The Kahn of Khelat has accepted the responsibility of protecting the line and the employes.

When the dear girls at the telephone die and go to heaven, won't they be able to recognize every angel by his halo? If the dear girls at the telephone don't attend to business a little, when they die they will be more apt to recognize the angels by their Hello.—*Major D., Old Guard.*

The Rocky Mountain Bell Telephone Company finds it possible, in that exceedingly dry climate, to put telephones on a common barbed wire fence, and make a satisfactorily working line in that way. The company has one line about sixty miles in length, one-third of which is of barbed wire. The line works perfectly.

New England telephone shares sold at 36 Friday morning, and a little later the directors met and voted to pass the quarterly dividend in April. It was a question of borrowing money or passing the dividend, and the conservative policy prevailed. Some objection may arise among stockholders, but they will, on reflection, probably prefer a temporary sacrifice to the creation of a permanent lien in the shape of bonds before their stock.

PHILADELPHIA.—A suit was commenced on the 20th inst. in the United States Circuit Court for the Eastern District of Pennsylvania, by the American Bell Telephone Company and the Bell Telephone Company, of Philadelphia, against the Baxter Overland Telephone Company, Geo. W. Mears, Morris H. Alburger, and others The complaint is based on the telephone patents of Alexander Graham Bell. The defendants are charged with infringing the Bell patents. An injunction is asked for and damages claimed.

The Netherlands Bell Telephone Company, formed in December, 1880, now has a total number of subscribers amounting to 2,053. In Amsterdam there are 1,076 subscribers to the company's system; in Arnheim, 121; in The Hague, 156; in Rotterdam, 494; in Groningen, 64; in Utrecht, 76; in Haarlem, 58, and in Zaandam, 19. Several of these exchanges have only been established during the last fifteen months. The number of calls per month in Amsterdam, where an exchange was established in July, 1881, now amounts to 101,500.

New Postal Telegraph Bill.

WASHINGTON, D. C.—The bill introduced by Representative Morse, on the 24th ult., to provide for the transmission of correspondence by telegraph is the Gardiner G. Hubbard scheme for a postal telegraph company, and creates that gentleman and his associates a corporation for the performance of postal telegraph service, under contract with the postmaster-general, bearing the name of the United States Postal Telegraph Company. Should this bill pass it would establish a very pleasant occupation for the above named gentelmen and their friends.

Telephone Talk Between Here and Boston.

Experiments were made last Thursday and Friday by the American Bell Telephone Company in transmitting conversation between this city and New York, over a No. 12 copper wire built especially for the experiments. A metallic circuit was established, and with the aid of ordinary telephone instruments, without special adjustment, the faintest whisper of conversation could be heard. Previous experiments have been made, but none so successful as this.

The Telephone at Naples, Italy.

A curious telephone experiment is reported from Naples. Mr. Moltein, the sub-director of the Telephone Company of Naples, and an æronaut made a balloon ascent. Mr. Moltein made experiments as to the possibility of telephonic correspondence with the earth, and, though one of his wires broke almost immediately, the other acted well enough, and the voice of his assistant reached him loudly and clearly. The remaining wire, however, shortly became entangled with the telegraph wires over the city, and Mr. Moltein was obliged to abandon it; but before doing so he had noticed that electric currents had been established proceeding from the earth to the balloon, and accompanied by crackling sounds.

We had an agreeable call, says the *Emmettsburg Chronicle*, recently, from Messrs. Miller, superintendent, and G. H. Morgan, manager of the Chesapeake and Potomac Telephone Company, from Frederick city. The object of their visit was the introduction of the telephone into Emmettsburg. They are certainly the right men in the right place, courteous in manner, thoroughly conversant with their business, and apt and lucid in explanations of its details. Their visit was altogether entertaining. We arranged for the introduction of the instrument into our office, and we are pleased to learn that the gentlemen have made fifteen contracts in this place, and, among others, at St. Joseph's House and Mt. St. Mary's College. Thus we overcome the complaint of the past that communication with Baltimore was easier than with the town, but two miles distant, while Baltimore is sixty miles.

A Landing for the New Cable.

BOSTON, March 26.—The Commercial Cable Company, which owns the new Mackay-Bennett cables, to-day completed the purchase of the land necessary for a landing at Rockport, on the north shore, at a point known as Cape Hedge, at the southerly end of the town, nearly opposite Thatcher's Island. The site of the landing is just inside a small arm of the mainland. The property was purchased for the company by its agent, Mr. Ward, of New York. The company will begin at once the erection of a building in the Gothic style, and will also erect a two-story structure, to be used as a main office, in the center of the town. The point where one of the cables is to land has, during the past few years, been attractive as a summer resort, and there are in the locality several elegant summer residences.

Another Manager Resigned.

Mr. S. M. Cortright has tendered his resignation as superintendent of the Eastern Division of the Pennsylvania Telephone Company, to take effect April 1st next.

There is no business which is subjected to so many disturbances, annoyances, and complaints as the telephone. Mr. Cortright has over 700 subscribers in his district, and the constant worriment to which he has been subjected during the past year in order to keep the lines and instruments in proper working order, and reduce the number of complaints of the subscribers to a minimum, has been attended with sleepless nights, a great strain on his system, and a gradual impairment of health. He has, therefore, found it necessary to retire from the telephone business and seek recreation for a few months, after which he will engage in the coal business, in which he has had considerable experience.

Bell Telephone Company.

ANNUAL MEETING OF THE STOCKHOLDERS ON TUESDAY, THE 25TH ULT., IN BOSTON—THE ELECTION OF OFFICERS—EXCELLENT REPORTS FROM THE DIRECTORS AND TREASURER.

The annual meeting of the stockholders of the American Bell Telephone Company was held March 25th at the Meionaon. There was a fair attendance, though not as large as that of a year ago. President W. H. Forbes occupied the chair, and after he ad called the meeting to order, Clerk Charles E. Hubbard read the call for the meeting as follows:

BOSTON, March 15, 1884.

To the Stockholders:

Notice is hereby given that the annual meeting of the stockholders of the American Bell Telephone Company will be held at the Meionaon, No. 78 Tremont Street, Boston, on Tuesday, the 25th day of March, 1884, at 11 o'clock in the forenoon, for the following purposes:

1. To elect officers for the ensuing year.
2. To consider and act upon the question of amending article 1 of the by-laws to provide that the annual meeting of the stockholders shall be held on the third Tuesday of February in each year, instead of on the last Tuesday of March.
3. To transact such other business as may then properly come before the stockholders.

It was then formally determined that a quorum of the stockholders was present, the minutes of the last meeting were read and accepted, and President Forbes then submitted the annual report of the directors, which was in full as below:

THE DIRECTORS' REPORT.

The growth of our business for the past year has been healthy, and in some directions very active. The demand for new telephones fell off during the winter months, but the net output for the year was 57,299, against 60,337 for the previous year. This falling off seems to be partly due to dullness in general business, and partly, perhaps, to the fact that in some parts of the country telephone managers have put their strength into connection of towns with each other, which, though adding to the value of each exchange, does not increase the number of instruments in use as much as if the work was done on the exchanges themselves. The increase in this branch is very marked, the number of miles of wire having increased during the year from 13,653 to 29,359. The following tables give a comparative statement of the statistics of the business:

EXCHANGE STATISTICS.

	JAN. 1, 1883.	JAN. 1, 1884.	INCREASE FOR THE YEAR.
Exchgs. in operation	735	890	165
Miles of wire on poles	54,146	70,171	.....
" " buildings.	15,306	12,703	.....
Total miles of wire.	69,452	82,879	13,427
Number of circuits.	74,737	97,184	22,447
Number of subscribers..	97,735	123,533	25,798
Number of branch offices	345	419	74
Number of employes	3,704	4,777	1,073

EXTRA TERRITORIAL LINES.

	JAN. 1, 1883.	JAN. 1, 1884.	INCREASE FOR THE YEAR.
Licenses issued.....	256	432	176
Miles of pole lines..	6,154	20,592	14,438
Miles of wires.....	13,653	29,359	15,706

INSTRUMENTS.

	FEB. 20, 1883.	FEB. 20, 1884.	INCREASE FOR THE YEAR.
In the hands of licenses under rental	249,711	307,010	57,299

Since the last report 165 new exchanges have been built, 13,417 miles of new wires added in the exchanges, and 25,798 new subscribers connected. The treasurer's statement for the year ending February 29, 1884, and the report of the auditing committee are appended. The former shows that the gross earnings of the year were $2,295,594.07, and the net earnings $1,475,431.37, as against $972,044.28 the year before, an increase of $503,000. Adding balance of income from previous year and miscellaneous credit items, we have a total of $1,734,804.78, out of which dividends have been paid of $1,051,479, $334,441.61 carried to surplus account, leaving a balance to our income account of $348,884,17. Our chief source of revenue is still from rental of telephones, the receipts of which were $1,695,678.58. The dividends upon our stock in licensed companies amounted to $440,923, an increase of over $200,000. The income from extra territorial lines was $45,819.68, and this item should be largely increased in the coming year. The amount received from the increase of the capital stock has been used in the payment of the notes of the company and in the further purchase of interests in licensed companies. In addition to the cash purchase of interests in local companies, $9,998,850 has been received in the stock of those companies for licenses issued, and our holdings in those companies now amount to about $19,000,000. The business of nearly all the licensed companies is reported in prosperous condition, and these companies are generally earning and paying fair dividends. The demand for new lines continues, and, as it would be unwise to fail to meet the same promptly, it will be important for most of the companies to provide for considerable construction expenses during the present year. The same is true in Canada, where the Bell Telephone Company's affairs are in good condition, and 6 per cent. dividends are paid upon its capital of $1,000,000. Construction expenditures to the extent of some $100,000 must be provided for these, and the managers in Canada are making arrangements for this in Montreal at the present time.

A consolidation of the companies operating in Maine, New Hampshire, and Vermont, and all of Massachusetts except the portion licensed to the Southern Massachusetts Telephone Company, was arranged in the autumn, a new company being formed called the New England Telephone and Telegraph Company, which took over the business on the 1st October. For the stock interest held by us in these companies, and for our prop rty in Boston, with a permanent license for the whole territory, we were paid a majority of the stock of the new company, upon which we waive dividends to an amount corresponding to the conditions existing in the old companies.

The business of the New England company is increasing and promising. There is a steady demand for new connections with its exchanges, and also a demand for lines between many of the towns, which ought in all the more urgent cases to be met. The company has met with losses by the fire in January in its principal exchange, and the repeated sleet storms in February, while the weather has been such as to render work on construction and maintenance all over New England unusually slow and expensive. The net earnings will not be sufficient to provide funds for necessary construction as well as for dividends, and the question of providing for these needs is before the directors of that company at the present time.

The tendency toward consolidation of telephone companies noticed in our last report has continued, and is for the most part in the interest of economical and convenient handling of the business. The connection of many towns together, causing large territories to assume the character of great telephone exchanges, made it of importance to bring as large areas as possible under one management, to ensure simple and convenient arrangements for furnishing rapid intercommunication. As methods are devised for making the telephone commercially useful over long lines, the advantages of this

centralization of management will be still more apparent, as well as the importance to the public of having the business done in large territories under one responsible head, with far reaching connections throughout the whole country. To make this service of the highest value to the people will be complicated enough under one control.

Were it in the hands of many competing companies the confusion resulting would be very serious, as the value of the telephone will be largely measured by its capacity to give prompt connection with all parts of the country.

The question of bringing this about to the best advantage is the one to which we have now to address ourselves. The task is no light one, and it is one in which we have a common interest with the public; and in spite of the prevailing opinion that the development of the telephone substantially under one control is against public interest, we believe that an intelligent examination of this question would demonstrate that this is not true, and that in no other way could the desired results be obtained and the difficulties be surmounted so rapidly and so well as by the present one.

It is desirable also that the difficulties attending any radical change from the present overhead system of wires should be better understood. It is common to see in the public papers round statements that the wires ought to be at once ordered underground. In this matter we and our associates have the strongest motives for wishing to get wires underground as far and as soon as it can be done without destroying the efficiency of the service. The plant would be more permanent, and, no longer liable to interference from municipal authorities or individuals or destruction from storms, its maintenance would be cheaper and easier. But, although short trunk lines work fairly well beneath the surface, as shown in Boston and elsewhere, in the present state of the art it is impracticable to put the bulk of the wires underground without interfering seriously with facilities upon which the public are now getting to depend. Conversation over long lines (those reaching the suburbs even) is difficult and often impossible to those who are connected through the underground cables. Were the electrical difficulties overcome, a mixed system would still be needed, as the distribution of the wires would probably have to be overhead, as well as the wires in the more sparsely covered parts of a city. Overhead cables are rapidly coming into use, and as they can be taken on small fixtures and carry many wires in a small compass, while attracting far less notice than the open-wire system, besides being safer in case of storm or fire, their adoption is a step in the right direction, and will go far to remedy the evils of the present overhead system.

Whenever we have had an opportunity to explain the difficulties attending this question to committees of legislatures who have been called upon to consider it, we have satisfied them that at present no general change to underground wires can be attempted for telephone service.

The question of rates deserves careful consideration. Complaints in this respect are less common than formerly, as the facilities have been increased and the service improved, and it may safely be said that a large majority of those who use the telephone most now feel that they receive full value for the price paid.

The complaints as to rates are often made thoughtlessly and in ignorance of the expenses and risks which attend the business, but the business is too new to enable us to say what is the fairest system of charges, or to have established with certainty what is the cost of operating the business and maintaining the plant.

A few facts that we do know bear upon this question and are worthy of attention. The number of connections in the United States is now estimated as at the rate of 215,280,000 per annum, or 4 85 per subscriber per diem. The cost of these connections varies from 2½ to 5½ cents each, and depends partly upon the skill and economy of the exchange management, partly upon the number of calls per diem and partly upon the kind of service paid for; *i. e.*, some exchanges charge low rates and put a number of persons on a line; the connection is slower and worth less than where each person pays enough to have a separate wire. It is estimated that 29,000 miles of extra-territorial wire are now giving 5,220 connections per day, or 1,879,200 per annum. The average rate for distances inside of 35 miles is 25 cents, for which at least 100 words each way can be had if desired, with all the advantages of immediate response. The average rate to the public at telephone toll stations for short circuits is 15 cents. The average price of telegraph messages in the United States is 38 cents, and for distances inside of 35 miles about 20 cents—and the rate for short circuits is about 15 cents. These rates are for ten words, the reply costing the same, with delay according to circumstances. It is doubtful whether any company except one doing a business of as vast a volume as that of the Western Union Telegraph Company could give telegraph communication as cheaply as this.

We do not think that the telephone charges appear unreasonable when it is remembered that a telephone exchange wire that is only used five times in the twenty-four hours has to be maintained in idleness most of the time with enough operators always on duty to meet the maximum of calls that are liable to be made, whereas a telegraph wire is kept working and earning day and night, only as many being put up as can be kept busy, with some margin for accidents. Moreover it should not be lost sight of that short as is the time since our business was started it has been the fate of most of the telephone companies to reorganize and rebuild their exchange more than once, as the necessities of the service revealed themselves, and that the companies are by no means at the end of their costly changes yet.

The electrical department continues its work of original investigation, of experiments upon apparatus, of examination and testing of all new inventions that appear, and of tests and experiments required in the suits. Several inventions which promise to be of great value in the future development of the business have been produced during the year. Especial attention is being given to long line service, and we have just built a line between Boston and New York, now almost ready for trial; with this we shall see whether sufficiently good results can be obtained for commercial purpose, and if the result is satisfactory, we propose to have the experiment at once followed by the establishment of lines for public service between these and other points of importance. We have renewed our arrangements with Mr. Bell for his experimental work, and that of his associate in the Volta laboratory, and all telephonic inventions made by these gentlemen belong to the company. They are now at work upon some investigations of importance, and we shall hope for valuable results.

Our legal expenses continue large, and this must be expected, until several of the suits now in progress are finished.

The stockholders have been annoyed by having pamphlets and newspaper articles repeatedly sent to them in the interest of companies claiming to have valuable telephone rights with which they proposed to take the field, or to destroy the value of the patents of this company. The purpose of this method of attack is manifestly to alarm our stockholders and create distrust in the public mind as to our property. This seems to us unwarrantable and wholly unusual among business men of repute, a weapon only likely to be used by those who have no confidence in legitimate business methods for their ends, and we have declined to take part in the attempt to carry the contest into the newspapers or to be drawn into negotiations with parties, who we are advised, have nothing of value to sell.

As some of our stockholders, unused to litigation and unacquainted with questions of patent law, have made some inquiries of us as to the meaning of these frequent attacks, we have thought it proper to send to each stockholder and to our licensees, who are equally interested in all that concerns us, the brief and arguments of our counsel in the recent case against the Overland Company in Philadelphia, where the story of the principal claimants is made public, as well as an interesting account of Mr. Bell's invention.

As to the litigation during the past year upon Mr. Bell's telephone patents: The suit against Dolbeer *et. al* was argued on final hearing early in July. The Court rendered a decision confirming its former decision in the case. The accompanying letter from Messrs. Chauncey Smith and J. J. Storrow gives the present condition of our suits against the People's Telephone Company and the Overland Telephone Company, from which it will be seen that the gentlemen have the same confidence in a satisfactory termination of the Drawbaugh litigation they have always expressed:

BOSTON, March 18, 1884.

William H. Forbes, Esq., President American Bell Telephone Company.

DEAR SIR:—The most important litigation under Mr. Bell's telephone patents during the past year has been the suits which involve the Drawbaugh controversy, now approaching a hearing. The Drawbaugh story rests upon oral testimony. A very large number of witnesses have been called upon both sides Your counsel have always felt that this oral testimony for the defence, although at first sight it appears formidable from its mass, does not, when subjected to intelligent scrutiny and compared with indisputable facts, present the character or weight required to meet the positive proof and the documentary evidence introduced by the Bell Company. We have not changed our views in this respect. In January, 1884, a motion for a preliminary injunction under the Bell patent against the Overland Telephone Company was argued in Philadelphia. The evidence in the Drawbaugh case, so far as taken, was introduced for the defence. Your counsel had expected either that the Court would examine and consider that evidence, or else, if out of deference to the New York court, where the Drawbaugh case was pending, and where the Drawbaugh Company were under injunction, it declined to examine it, would place this Overland Company in the same position as the Drawbaugh Company. But the Court took a middle course, and determined to examine nothing and decide nothing, but suspend action until a reasonable time had been afforded for the principal case to come to a final hearing. A fortnight after the oral announcement of this determination the Overland Company sought to have a decree entered, which, by its language, seemed to imply that the Court had denied the injunction on its merits. The Court refused to enter the decree so asked for, and, stating that it did not wish to be understood as having denied the injunction, entered an order, Feb. 6, 1884, as follows:

"After hearing and consideration, it is ordered, in view of the peculiar circumstances of the case, that the motion stand over for the present, with leave to either party to call it up hereafter.'

There is reason to expect that the principal case will be argued during the coming term at New York.

(Signed) CHAUNCEY SMITH,
JAMES J. STORROW."

REPORT OF AUDITING COMMITTEE.

BOSTON, March 19th, 1884.

William H. Forbes, Esq., President American Bell Telephone Company.

DEAR SIR:—I enclose herewith the report of Mr. C. T. Plimpton, the accountant employed by me to examine the books of account of the American Bell Telephone Company for the year ending February 29th, 1884.

Yours truly

(Signed) W. G. SALTONSTALL,
Committee on Accounts.

BOSTON, March 18th, 1884.

I hereby certify that I have examined the books and accounts of the treasurer of the American Bell Telephone Company for the year ending Feb. 29th, 1884, as follows:

The cash book's dates, debits and credits, and all accounts pertaining thereto, including all real accounts, the journalisings, stock, ledger, stock investments, bills receivable, bank accounts, and cash on hand. In my investigations have found everything in connection with the above correct. That all disbursements, as entered in the cash book, are sustained by approved vouchers. The certificates of stock investments and bills receivable, which the ledger calls for, are on hand or properly accounted for, and the statement of the treasurer, as exhibited by him Feb. 29th, 1884, is in accordance with the make-up of the book on that date.

(Signed) CHARLES T. PLIMPTON,
Accountant.

With the acquirement of large interests in our licensed companies comes the necessity of more oversight of the business, and, as far as it can be obtained without absolute ownership, an exact comparison of results. The organization of the company should be shaped to meet these requirements, and with proper watchfulness and effort on our part we may expect steady growth and improvement in the character of our business in all its branches.

For the Directors.
W. H. FORBES, President.

ELECTION OF OFFICERS.

The above report as presented was accepted and placed on file, and the election of officers was then proceeded to, resulting in the choice of the following-named: Charles E. Hubbard, Clerk; William R. Driver, Treasurer; and Messrs. Francis Blake, Charles P. Bowditch, Charles S. Bradley, George L. Bradley, Channing Clapp, Alex. Cochrane, William H. Forbes, Charles Eustis Hubbard, Gardiner G. Hubbard, Robt. B. Minturn, Wm. G. Saltonstall and Thos. Sanders, Directors.

President Forbes then announced that when the second article in the call relative to the changing of the date for holding the annual meetings was inserted, it was proposed to have the fiscal year commence January 1st, but as the returns from the sub-companies were very slow in coming in, and as on this account it would be impossible to get the accounts of the corporation all made up before the first of March it had been deemed advisable to take no action on this matter.

In response to his query as to whether there was any other business to come before the meeting, Mr. P. S. Grand offered a resolution, prefacing it with a few remarks. It was subsequently withdrawn.

The Electro-Chemical Equivalent of Silver.

The quantity of silver in grammes deposited by a coulomb of electricity is generally called the electro-chemical equivalent, and the figure is usually given as .0011340. Under the C. G. S. (centimeter-gramme-second) system of units, the figure becomes .011340, for one coulomb is one-tenth of the C. G. S. unit of quantity. A recent determination of Lord Rayleigh, however, makes the corresponding figures .0118 and .00118. It follows that a current of an ampère will deposit 4.025 grammes of silver per hour. Lord Rayleigh's result was obtained with great care, and is probably as accurate as we may expect to get it for some time. It will prove very useful in calibrating electric current meters. It was obtained with a silver plate voltameter containing nitrate of silver solution.

Recent and very satisfactory trials have, we understand, been made by the National Telephone Company on their trunk line between Greenock and Glasgow, of a telephone circuit devised by Mr. Smillie. The telephone instruments at each end are each connected in circuit with a flat circular coil of wire, without a core, and the earth. These coils are confronted by equal and parallel coils of wire, also without cores, and in circuit with the main line wire and a loop line, thus forming a continuous going and coming circuit. The message is induced into the line by these coils, which, not having soft iron cores, exercise little retarding influence on the currents.—*Engineering.*

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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Give Us Electric Railroads—Endless Rope Projects Not Wanted.

It is rumored, and indeed it has been openly charged, that the Rapid Transit Commission, which has been sitting for some time in this city, were appointed through the influence of that detestable monopoly and bad-smelling ring, the Standard Oil Company. This commission has talked about nothing but endless ropes as a means of propulsion, notwithstanding the fact that the endless-rope railway on the Brooklyn Bridge has never ceased to be anything but a lamentable failure.

The whole town has believed that there was something very suspicious in the fact that this so called Rapid Transit Commission was able to devote so much of its time to this subject without remuneration of any kind, and to travel even as far as Chicago at their own expense; but it was not until quite recently that the secret leaked out, and now the presence of a colored gentleman on the rapid transit fence is so apparent that only those totally blind can fail to see him.

It seems that the Standard Oil Company is indirectly connected with a company which, when not engaged in blowing the public streets in the air, endeavors to supply a certain very limited portion of the community with steam. Having more steam on hand than there is likely to be any demand for, the brilliant idea occurred to the Standard Oil Company's stockholders and their copartners that it wouldn't be a bad idea to take charge of the rapid transit business of the city of New York and supply the necessary steam for the propulsion of cars and tramways. This would place the city of New York in the position of an adjunct to the Standard Oil Company, and be still another proof that the tail is sometimes strong enough to wag the dog.

Through the scheming of these people the public is not permitted to reap the benefits of electrical carriage, which has given such evidence of excellence that it is being adopted in many parts of Europe. Attempts in this country to substitute electric railroads have not as yet got beyond the period of promises, stock-jobbery, and speculation.

There is much talk of a Broadway arcade railway, and here is the place for a commencement. The time for endless-wire railways, like the time for stage coaches, has gone by.

We were the first to adopt the electric light and the telephone, but owing to stock-jobbing the Europeans, who rarely adopt anything until they hear from America, as to its practical success, are way ahead of us. A report says:

The success of the Brighton Electric Railroad has stirred up general interest in London, and the work of building similar ones is rapidly progressing. The Brighton Road extension will be opened at the end of this month. The short road was operated from August 2, last year, to January 4, last, and in that time thirty thousand passengers were carried. This road only ran from the aquarium to the chain pier, and had a gauge of two feet. A Siemens motor was used, ran by an Otto gas-engine of two-horse power. The car was small, and only carried ten passengers. In order to continue the road a mile further on, it was decided by the operating company to relay the track with a new two-foot nine inch gauge. This has been done, and the road is to be opened in a few days. As before, a Siemens dynamo will furnish the current, and the dynamo will be run by an Otto gas-engine of increased power. The generator and engine are to be situated under the sea-wall in a vault. During the time of the road's operation last fall, there was not a day that it did not pay a profit.

Work is now being rapidly pushed on the Charing Cross and Waterloo Road, which will run from the Waterloo station of the London and Southwestern Railway to Charing Cross, a distance of five furlongs and two chains. The capital of this road is £100,000, or 10,000 shares of £10 each, and the company can only use electricity as the motive power, The road passes under the Thames in a tunnel which is now being dug. This work, with that of the underpinning necessary along the line, makes it a difficult piece of engineering, but it will be finished as soon as possible. The Siemens have taken a contract to operate this road for a year. A third company, with a capital of £500,000, has laid out four new routes of electric railroads. These routes are from St. Martins-in-the-Fields to St. Giles-in-the-Fields, three furlongs 7.4 chains in length, from Piccadilly to St. James, from St. Giles to Newgate, and from Newgate to St. Michaels. These roads are to be fitted up with handsome cars, and the Siemens dynamos will furnish the current.

The public demands that the best mode of conveyance shall be furnished. Electricity has shown itself to be superior to all other agents for the propulsion of motor.

Not all the monopolies in the land, headed by the Standard Oil Company, which is the rankest of all, can thwart the will of the public. We must have electrical railways in the city of New York.

Is Prof. Chandler Interested in Water-Gas Manufacture?

What has come over Prof. Chandler? Some time since he was removed from the Board of Health of this city, and since, it would seem, he has devoted much of his time to recommending as an illuminant a dangerous, indeed, we might truthfully say a deadly, fluid called water-gas.

Recently a bill was presented in the New York Legislature looking to a prohibition of the manufacture of water-gas in the State.

Last week, before the State Board of Health, Prof. Chandler gave his opinion on the water-gas question. Here is a report of what he said:

"Water-gas, he said, contained three times as much poisonous carbonic oxide as coal-gas, and yet practically was no more dangerous. In cases of suffocation by it, the victims would die just as surely from coal-gas, but in a little longer time. The reason why there were more cases of suffocation from water-gas than coal-gas was, Prof. Chandler said, because in the places where suffocations usually occur, as in hotels and apartment houses, more water-gas was used. Water-gas was used by half the people in New York, especially in hotels and theaters, and nobody considered it dangerous except the coal-gas companies. Prof. Chandler further said that the reason why water-gas had not been introduced into Europe was the difficulty of manufacturing it there, owing to a lack of anthracite coal. He added that although water-gas was heavier than coal-gas, it could not sink down and smother a person, because it was two-thirds lighter than air. He insisted that it had a decided odor, as every illuminating gas had, and that it furnished 50 per cent. more light than coal-gas for the same price."

After the experiments which have been made both in this country and in Europe—experiments, albeit, made with a settled purpose to show water-gas to be at least comparatively healthful, and the signal failure of each and every attempt—it seems strange that Prof. Chandler should come forward as an apologist. Nay, more, it seems stranger that he should insist upon claiming virtues for it which we have the most eminent authority for saying it does not possess.

Prof. Chandler's reputation as a chemist is purely a local one. He is not known out of the State of New York, if it reaches that far. But there are chemists and analysts who have world-wide reputations for ability and reliability, and these are unanimous in condemning water-gas as a poison that should not be admitted into any house or building frequented by human beings.

Nor may it be said that Prof. Chandler had discovered some new process of making water-gas by which it is rendered less deadly. This is not the fact. He referred to the Tessie de Motay process, which is the best known.

Let us see what has been the history of this water-gas, which Prof. Chandler says is not unhealthy:

In France, where its use as an illuminant originated, the authorities, after careful investigation, forbade its distribution for that purpose. This restriction was the result of a report made by M. Pelouse to the Municipal Council of Paris. He says: "It was proven that a mixture of one per cent. of oxide of carbon killed a strong dog in a minute and a half. It was a case of poisoning. With one per cent. of oxide of carbon all animals died at the end of a few minutes. These experiments terrified me. Since then they have been repeated many times by men of science. Carbonic acid must not be confounded with oxide of carbon. In the course of the experiments of which I have just spoken, I formed an artificial atmosphere with thirty per cent. of carbonic acid. A large dog, on being placed in it, almost immediately fell on his side, but recovered himself on being restored to the pure air. Thirty per cent. of carbonic acid did not kill; but, on the contrary, one per cent. of oxide of carbon is mortal."

Ruled out of France because of its poisonous qualities, its manufacture was begun here, the same process (Tessie de Motay) being adopted.

We satisfied ourselves long ago that coal-gas was far from healthful; indeed, that in the case where persons were afflicted with certain disorders of the vital organs that it was absolutely injurious and often fatal. But this water-gas is shown by analysis to be *thirteen times* as dangerous as coal-gas, since, as will be seen by the following figures, it contains thirteen times as much carbonic oxide (a deadly poison) as the latter:

COAL-GAS.

Hydrogen	42.47
Carbonic oxide	2.08
Marsh gas	46.16
Illuminants	6.67
Air	2.62
	100.00

WATER-GAS.

Hydrogen	38.20
Carbonic oxide	27.14
Marsh gas	15.82
Illuminants	15.29
Nitrogen and oxygen	3.45
Carbonic acid	.10
	100.00

Since the introduction of water-gas in 1878 into this city and Brooklyn, over *two hundred* deaths have occurred directly traceable to water-gas, and many more have, it is well known, been indirectly caused by it.

Yet Prof. Chandler tells us it is not unhealthy, or, at least, not more so than coal-gas, in the face of the fact that it contains thirteen times as much carbonic oxide as coal-gas. In fact, Prof. Chandler, with a disregard for well-established facts—facts ascertained and corroborated by far better known authorities than he is—tells us that water-gas contains only three times as much carbonic oxide as coal-gas.

In our humble opinion we should say, even taking Chandler's figures as correct, that water-gas was three times as deadly as coal-gas, since it throws out three times as much of a deadly poison as does coal-gas.

The manufacture of water-gas has, as is well known, been forbidden in Massachusetts by statute. A great effort is now being made by a few unscrupulous persons to obtain the right to manufacture this and to distribute it about Boston. The Legislative Committee on Manufactures gave a hearing to this question last week, and the testimony elicited concerning water-gas is extremely interesting, besides being a refutation of the testimony of Prof. Chandler, who fortunately is no longer responsible for the health of New York.

Mr. C. P. Greenough continued to put in evidence against the legal modification asked for, submitting first a summary of accidents caused by water-gas showing that in, New York City since 1880 there have been 67 deaths and 11 casualties from that cause, and 4 doubtful cases—that is, of accidents that might have been caused by other gas. He said that these cases had been taken from the hospital records, and that he had determined their cause from their locality; all those suffering below Grand Street must have been caused by water-gas, and that gas alone is supplied to that part of the city. He added that the last case he has heard of was reported in the *World* last week; it was that

of a man who was exposed to water-gas but one hour, and who was found dead in his room. He said further that he has no personal knowledge of each case, but he has no doubt of the accuracy of the list, which has been published in part in the *Gas-Light Journal*, March 16, 1883, and in the Raymond report, and which has been brought down by Dr. M. V. Wilkie, of New York, to a recent date.

Mr. Greenough put in a letter from Dr. Wilkie, dated February 2, 1884, stating that the New York Hospital records are poorly kept, that of some cases there are no definite facts, and that those cases covered by his report are well authenticated, he having, or some of them, a complete story of their circumstances. Mr. Greenough repeated that he did not put this list in as absolute truth.

Mr. Malcolm S. Greenough, assistant to the agent and treasurer of the Boston Gas Light Company, said: "It is my business to keep myself thoroughly informed, not only as to the business of the Boston Gas Company in all its details, but also in regard to all the improvements of any kind which may be made in the manufacture. I have been in the service of the Gas Company almost without intermission since 1868. After graduating at Harvard College, I took a course of chemistry at the Institute of Technology, and I was the greater part of a year in a foundry in New Jersey, familiarizing myself with the details of iron manufacture. Since that time I have been in the continuous employment of the Boston Gas Company; in its interest I have made visits not only to different parts of this country, but to several places in Europe, to learn of improvements in the manufacture of gas. I am president of the New England Society of Gas Engineers, a member of the Society of Civil Engineers of the British Gas Institute, and also of the Technical Society of France."

This goes to show that Mr. Greenough is a competent authority. Read what he says about water-gas manufacture:

"The attention of the gas companies was called to it first in 1878; it seemed to have many advantages if it could be made as it was claimed, although it had the disadvantage of the necessity of handling great quantities of naphtha. Everybody knows the danger of the use and storage of naphtha in great quantities. In New York they keep their naphtha, a great portion of it, across the river, and bring it over in barges, and pump it very carefully into underground tanks. Notwithstanding this care, they have had one or two bad accidents through naphtha; they killed four men with naphtha in the Metropolitan Works; they blew up the Montreal Works, and they have had serious accidents in works in various parts of the country from naphtha. So to handle such quantities of naphtha as is necessary to make a great quantity of gas is a very serious thing. To use 500 barrels of naphtha a day in one works makes a company hesitate before attempting it. If we should use naphtha in the Boston works and carry three months' supply (we carry in the winter six months' coal), it would require the keeping in store of 50,000 barrels of naphtha. We should have to make gas a great deal cheaper before we would have so much naphtha in store; a cent or two cheaper would not compensate for the risk. Then I don't believe the authorities in Boston would allow us to have any such amount of naphtha on hand."

Here is his testimony as to the deadliness of water-gas, and we should like to see Prof. Chandler disprove it:

"But after this gas began to be used for four or five years, it began to come to the knowledge of various people who were watching it carefully that people would die in these towns; that this water-gas was invariably accompanied by an increase of the number of deaths; that where coal-gas had been used without any marked number of people suffering from it and dying, where this water-gas was used they would die. Of course, the first feeling about it was that they would die anyhow; but it didn't seem to turn out that way. In cities where they had had the old gas for years and years without having had any number of deaths to speak of, when they used this water-gas the deaths would increase.

Eugene Vanderpool, of Newark, N. J., gas engineer of a company of that city, who has been a gas engineer for fifteen years, said:

"There has been no question in my mind that this water gas, containing from 25 to 30 per cent. of carbonic oxide, is too dangerous a gas for any company to distribute. He did at one time experiment with water-gas on a small scale. I agree substantially with the conclusions of Mr. Greenough.

"The first objection was that of expense, and then it was discovered that the gas was dangerous. Of course the dangerous character of the gas is now the first question; it is so dangerous that it ought not to be distributed unless its amount of carbonic oxide can be reduced. There are certain places where water-gas can be made cheaper than coal-gas; there are others where it cannot, but even if it were solely a question of expense, the companies will not introduce it because it is so poisonous. I would not recommend it to any company; I would not take that responsibility; I do not think I would have any right to do it, knowing what I do of the gas."

Here is an array of expert testimony that Prof. Chandler would do well to ponder over unless, as has been charged, he is interested pecuniarily in the manufacture of water-gas in this city, or hereabouts, which being the case, there would, of course, be as little use for meditation as for prayer.

After reading Prof. Chandler's testimony approving of the distribution of water gas, we cannot help—on account of suffering humanity—of being thankful that he has been removed from the Health department of the city of New York.

The fact is, that all gas—so far as illumination is concerned—must go. But until we are ready to light up dwellings and offices with electricity give us no water-gas. Coal-gas is bad enough, but water-gas is, according to all reputable analysts, except Prof. Chandler, thirteen times as deadly.

The Demand for Telephone Service.

The annual report of the American-Bell Telephone Company, which will be found elsewhere in this number, cannot fail to interest many readers of the REVIEW. By this report it will be seen that the company's business has progressed favorably during the past year; the demand for telephonic service all over the country is increasing at a pace but little short of remarkable. One hundred and sixty-five new exchanges have been built; 13,417 miles of new wire have been added to the various exchanges already established, and 25,798 new subscribers have been connected. The treasurer's statement for the year ending February 29, 1884, and the report of the auditing committee are of unusual interest.

The former shows that the gross earnings of the year were $2,295,594, and the net earnings $1,475,431, as against $972,044 the year before, an increase of $503,000. Adding balance of income from previous year, and miscellaneous items, we have a total of $1,734,804 out of which dividends have been paid of $1,051,479, $334,441 carried to surplus account, leaving a balance to the company's income account of $348,884.

This is a fine showing, and does credit to the skill of the company's executive officers.

Probably no country presents so favorable a field for commercial enterprise as these United States. In the Old World, innovations do not attract the public. The stupid argument that what was good enough for the father is good enough for the son prevails all over the European Continent, but is especially true of England. They fought against the adoption of the telephone in England until it was in general use in America, and now the old fogies have been compelled to step aside, and the whole business community will no doubt soon be able to obtain telephone service, if they desire it; though no doubt a large part of it is inclined to look with more favor upon the old method of sending a messenger to answer a question or demand an answer.

The men at the head of the Bell Telephone Company distinguished themselves long ago for executive ability. They formulated a plan by which general telephonic service could be made practicable; they met every obstacle in the path of success with unflinching courage, and despite the warnings of interfering incapables, they have at last developed their scheme to a thoroughly successful issue.

This system of the American Bell Telephone Company has now been adopted, in the main, all over the civilized globe, and the business world is once more indebted to American enterprise and ingenuity.

Concerning the Coming Electrical Exhibition.

We take much pleasure in presenting in this number a representation of the building in which it is proposed to hold an International Electrical Exhibition next autumn. The building is now in course of construction, and the view we give is taken from the architect's drawings.

Philadelphia has many advantages as a city in which to hold an international exhibition. It is only two hours' journey from New York on railways that, for speed, safety and comfort, it would be difficult to excel either here or abroad. The city itself is finely situated and possesses inexhaustible resources for public extertainment.

That an electrical exhibition is likely to be of great service, no one will deny who is at all acquainted with the condition of the electrical field in this country at the present writing.

When hundreds of skillful men are struggling toward the same goal, or seeking to find a solution of similar problems, those who bring them together that they may compare notes and exchange ideas will have done them an invaluable service, and might justly be termed public benefactors.

The tremendous impulse which electrical science has received in this country warrants the holding of an exhibition wherein the various systems and apparatus which have from time to time been devised in different parts of the country may be compared side by side as well as with similar contrivances from other parts of the civilized globe.

American electricians and projectors have done much for the general advancement of the science. It matters not whether Faraday or Oersted discovered the natural law upon which electric lighting systems are based, it was an American who discovered a system whereby that natural law could be made of benefit to the general public.

It is a small matter whether or not a German or a Frenchman discovered the germ of a system whereby sounds could be transmitted to a distance if it was to lie idle An American found a means of perfecting the system while, at the same time, making it of practical utility so that the whole public could have the benefit of it.

We owe to the Old World those great discoveries in pure science upon which most of our practical work of to-day is based, but as all discoveries are valuable only in so far as they lead to an increase in the World's knowledge or in practical advantages to the human family, those who carry out an idea to a practical conclusion, perform a work as valuable as that which made such practical conclusion possible.

The arrangements which have been made by the committee having charge of the arrangements for the coming exhibition will, with few exceptions, commend themselves to those who may be looked upon as desirous of partaking of the benefits of the enterprise.

It is to be hoped, however, that the Exposition will be permitted to stand on its own legs and in no way be made merely an adjunct of a particular institute, or be used to further the aims or advertise the wares of local manufacturers.

The idea, which has originated with the committee, of not awarding premiums, even to those who are deserving of official recognition, is a bold innovation and, it must be said, of doubtful expediency.

It is a serious question if such a determination on the part of the organizers, when understood, will not lead to an inundation of mediocrity and a plentiful lack of excellence. Indeed it might result in something even worse than this. It might lead to an introduction in every department of that which is of doubtful promise, and entered with exaggerated prospectuses by irresponsible persons with a view to delude the unwary. The only thing such persons are afraid of is official inspection and comparison and if, as the committee have advertised, all tests must be paid for by the exhibitor, it will be an easy matter to escape everything in the nature of a test and hence an irresponsible person may promise almost anything for his apparatus, or may make that appear to the uninformed which cannot be corroborated by expert trial.

Is it fair to the proprietors, inventors or projectors of systems which have already stood the most careful tests and come out unimpeached that they emerge from an international exhibition, which should be nothing if not critical, upon the same footing as that which has never been officially tried? Is it fair to those who have money to invest that the protecting robe of official sanction shall be inferentially thrown over anything that has not been carefully inspected, not to see if it possesses at least the germs of excellence, but that it is capable of realizing what its sponsors have promised for it?

Innovation, when supported by logical reasoning, is always to be commended, but it must be shown first, that, such departure from the highway of customary practice is called for; and second, that it is substantial.

What has an inventor or manufacturer to gain if no awards are to be made? Is it expected that either the one or the other are to be influenced or swayed by sentiment? If so, it will be found to be a grievous mistake. They will, naturally enough, ask themselves what advantage is likely to accrue to them from such an exhibition?—what return for their expenditure is likely to come? And if the answer is that they will have an opportunity to exhibit their systems or wares side by side with others, we will venture to assert right here that this will not prove a sufficient allurement, nor warrant them in going to the expense and trouble of preparing exhibits.

The REVIEW is in favor of an exhibition in Philadelphia in the autumn of 1884, and is ready to do everything in its power to assist the enterprise, but as the exponent of the views of American electricians and projectors, it deems it its duty to sound a note of warning thus early in the day, in order that the promotors of this enterprise may be fully advised and beware of taking incautious steps.

To our mind, the arrangements at the recent exposition in Vienna are difficult to improve upon. The plan of procedure was formulated by electricians of undoubted ability while in conference with business men of experience.

The general idea which pervades this plan was that, while the most obscure inventor should have the same consideration shown him as the proprietor or projector of an elaborate system, his apparatus, if inferior to theirs, should by no means be classed in the same category or even be permitted, by reason of a lack of awards, to remain there by inference.

Again, an electrician, inventor or manufacturer whose ideas or wares prove of superior excellence is entitled to official credit; and we cannot understand upon what theory of ordinary justice the committee having in charge the arrangements for the coming exhibition, propose to withhold it from him.

It is the inalien right of excellence to recognition even if it be at the expense and to the discredit of those who are equally earnest and trustworthy, but lack skill. A fair field and no favor with absolute discrimination against charlatanry and humbug is, in our opinion, the only motto for an electrical exhibition.

New Books for Sale by Cumming & Brinkerhoff, Publishers' Agents, 219 East 18th Street, New York City.

"Berly's British, American and Continental Electrical Directory" (1883 Edition), price $2, with English, French, Belgian, Russian, Scotch, Irish, Canadian, German and United States sections. This valuable publication contains a full record of all the industries relating to electricity and magnetism; has complete lists of all persons connected (directly or indirectly) in the trade or professionally with the science of electricity; being a comprehensive handbook for the use of electricians and manufacturers in Europe and America, with valuable information to aid both students and business men, such as tables, formulæ, difference of time at principal places, lists of telegraph, telephone and electrical light companies, members London Electrical Society, patents, societies, publishers, newspapers, books, etc. Royal octavo (6x10), 800 pages, handsomely bound in red and gold, and printed on super calendered paper. "Berly's Universal Electrical Directory," being the 1884 edition of this great electrical annual, thoroughly revised and many new features added to interest the manufacturer, the student and the practical electrician. Royal octavo, 800 pages. $3. Third edition, thoroughly revised and greatly enlarged (1884), "J. A. Berly's Universal Electrical Directory and Business Advertiser," with British, French, Belgian, Russian, Canadian, German and United States sections. The electrician's "Vade Mecum," containing a complete record of all the industries directly or indirectly connected with electricity and magnetism, and the names and addresses of manufacturers and professionals in America, etc. Sub-titles in three languages; 25 000 names, both alphabetically and under trade headings. (See table of contents, enclosed.) "Parties desiring to increase their trade or professional interests by sending circulars will find this directory, with its thousands of addresses, invaluable for their purpose." Royal octavo, 800 pages. $3.

Last autumn one of the Thomson-Houston machines was shipped to Cincinnati, unaccompanied by any expert, and was intrusted to hands entirely unfamiliar with electric lighting. The result is that, even under these conditions, the machine has been running continuously, with the most satisfactory results. Parties who have traveled all over the world, and seen all systems of electric light, pronounce it to be superior to any they have witnessed, and orders have already been sent forward for more apparatus. We understand the company has recently made remarkable improvements in its apparatus at its factory in Lynn, under the direction of Prof. Thomson, and that sixty-three powerful 2,000 candle-power lights are now run from one machine, in which but one commutator is used.

Notice.

The new (1884) edition, "Berly's Universal Electrical Directory," now ready for delivery, price $3, has been thoroughly revised, greatly enlarged, and many new features added to enhance its value. Send for descriptive circular and table of contents. Cumming & Brinkerhoff, 219 East Eighteenth Street, New York City.

WANTED.—Wanted immediately, by the Kansas Electric Light Company, a man thoroughly competent to take charge of the electrical machinery of a 200-light plant where the Thomson-Houston system is in use. Good references as to practical ability and character required. Address E. R. Weeks, Supt., Kansas City, Mo.

WANTED.—An experienced telephone man that can take position of managing an exchange, and will work himself in construction. Address Foreign, care of ELECTRICAL REVIEW.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING MARCH 25, 1884.

295,531 Telephone support; Geo. W. Fish, Pecatonica, Ill.

295,534 Magneto and dynamo-electric machine; Friedrich Gustav Frick, Bayenthal, near Cologne, Germany.

295,552 Apparatus for regulating and distributing currents from dynamo-electric machines; William Hochhausen, New York, N. Y.

295,559 Coupling for electric wires; George L. Ilson, Philadelphia, Pa., assignor to William J. Phillips, same place.

295,574 Sealed galvanic battery cell; William T. McGinnis, New York, N. Y., assignor to James H. Shaw, same place.

295,581 Combined door-plate and mail-receiver; Robert G. Page and Walter J. Weo, Lynchburg, Va.

295,614 Driving gear for dynamo-electric machines; John W. Boothby, New York, N. Y.

295, 644 Printing telegraph; Albert F. Johnson, Brooklyn, N. Y.

295,652 Electric implement; Arthur H. Kinder, Boston, Mass, assignor to Amasa S. Barnes, same place.

295,664 Electric lamp; Wensel Moraba, Chicago, Ill.

295,671 Galvanic battery; Conrad Pabst, Stettin, Germany.

295,696 Electric hot-air furnace regulator; Frank Miller Sparrow, Mattapoisett, Mass., by mesne assignments to himself and William E. Sparrow, same place.

295,710 Sidewalk, curb, and surface case for electric wires; Richard Wylie, Napa, Cal.

295,741 Telephone transmitter; Daniel Drawbaugh, Eberly's Mills, Pa, assignor to the People's Telephone Company, of New York

295,742 Telephone transmitter; Daniel Drawbaugh, Eberly's Mills, Pa., assignor to the People's Telephone Company, New York.

295,759 Electric fire-alarm; John Hill, Columbus, Ga.

295,789 Armature coil for Dynamo-electric machines; James J. McTighe, Pittsburgh, Pa.

295,804 Telephonic receiver; Charles A. Randall, New York, N. Y

295,805 Telephonic transmitter; Charles A. Randall, New York, N. Y.

295,806 Telephonic transmitter; Charles A. Randall, New York, N. Y.

295,807 Telephonic transmitter; Charles A. Randall, New York, N. Y.

295,836 Double carbon arc lamp; Elihu Thomson, New Britain, Conn., assignor to the Thomson-Houston Electric Company, of Connecticut.

295,855 Telegraphic system; Charles G. Burke, Richmond Hill, N. Y.

295,873 Electric alarm for spring clocks; Edward Jungerman, Gettysburg, Pa.

295,889 Battery electrode or element; Eli T. Starr, Philadelphia, Pa., assignor of one-half to H. M. Lewis and James W. White, both of same place, and William J. Peyton, Washington, D. C.

A printed copy of the specification and drawing of any patent to the annexed list, also of any patent issued since 1865, will be furnished by any of the patent solicitors whose advertisements appear in this journal. In ordering please state the number and date of the patent desired.

ELECTRICAL AND MECHANICAL ENGINEER, very experienced in designing dynamos and lamps, &c., &c., wants position as electrician, with already established or now forming company. Address "Electrician," P. O. box 88, Greenpoint, L. I.

The Ansonia Brass & Copper Company of New York, is now manufacturing what it calls "acme bronze" wire, especially for telegraph and telephone purposes, which is highly spoken of. Lake Superior copper is used in its construction.

Neatly-bound volumes (half-yearly) of the ELECTRICAL REVIEW will be sent, postage prepaid, on receipt of $3; also the latest improved self-binders for the ELECTRICAL REVIEW, or any other electrical or scientific journal published in this country, for $1. Delano & Company, publishers, 23 Park Row, New York, N. Y.

WANTED.—First-class men on burglar alarm, hotel and house annunciator work; also first-class electrical instrument makers in western city. Permanent positions to right men. Address, with reference, giving experience, D., care Electrical Review, 23 Park Row, N. Y.

BUSINESS NOTICES.

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A. G. DAY, Kerite Insulated Telegraph and Telephone Wire and Cables, Anti-induction Kerite Telephone Cables, CLARKE B. HOTCHKISS, New York. Send for circular and prices.

ALFRED F. MOORE, Philadelphia, Pa. Telegraph, Telephone, Electric Light, Office, Line and Annunciator Wire.

AMERICAN BELL TELEPHONE CO., Boston, Mass. Electric Speaking Telephones for Exchange Systems, Private Lines, and Speaking-tube Lines.

AMERICAN ELECTRICAL WORKS, Providence, R. I. Patent Finished Insulated Electric Wires, Telephone and Electric Cordage, Electric Light Wire, Magnet Wire, Patent Rubber covered Wire, Aerial and Underground Cables, &c., &c. Send for prices.

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ARMINGTON & SIMS, Providence, R. I. Engines for Electric Lighting and general use.

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B. W. PAYNE & SONS, Corning, N. Y. The Payne Single and Double Valve Automatic Engine. Send for catalogue.

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BUTLER SAFES, New York. Fire and Burglar-Proof.

CHARLES WILLIAMS, JR., Boston, Mass. Call Bells, Electric Bells, District Bells, Switch Boards, Annunciators, &c., &c. Write for quotations.

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CONNOLLY BROTHERS, New York, Patent Attorneys and Solicitors.

HARVEY, STAFFORD & CO., Acton, Ont., Canada Telegraph and Telephone Poles.

D. VAN NOSTRAND, New York. Scientific Books. Send for circular.

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IVISON, BLAKEMAN & TAYLOR, New York. Ink of all kinds and colors. Circulars sent on application.

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LOCKWOOD & FOSTER, New York. Learners' Telegraph Instrument.

MUTUAL DISTRICT MESSENGER CO., Boston, Mass. Addressing and Distributing Circulars &c., &c. D. J. Hern, General Manager.

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Average Telephone Stock Quotations, for week ending March 27th, 1884.

	Highest.	Lowest.
American Bell Telephone Co.	174	168
Central New York Telephone and Telegraph Company	164	160
Empire State Telephone and Telegraph Company	195	187
Hudson River Telephone and Telegraph Company	100	92
New York and New Jersey Telephone Company	86	74
Mexican Telephone Company	2½	2¼
New York and Pennsylvania Telephone Company	76	67
Southern Bell Telephone and Telegraph Company	125	120
Tropical Telephone Company	2	2½
Central Union Telephone Co.	100	90
Iowa Union " "	100	90
Missouri and Kansas Telephone Co.	98	80
United Telephone Co. (Kansas and Missouri)	99	80
Bell Telephone Company, of Missouri	160	150
Wisconsin Telephone Company	120	115
Cumberland Telephone Co	100	95
Great Southern Telephone Co.	100	92
Michigan Telephone Company	100	97
Chicago Telephone Company	290	280
Erie Telephone Company	41	36
Union Telephone Company	100	95
Southern New England Telephone Company	165	160
New England Telephone Co.	53	46
Chesapeake & Potomac Tel. Co.	100	95

Average Market Quotations of Battery Supplies for the Week Ending March 27th, 1884.

Leclanche Disque Cell, complete	$1.25
" Prism " "	$1.67
" Prisms, per pair	$1.00
" Carbon Mounted	30c.
" Jar Cover	12c.
" Sal Ammoniac, in bag	8c.
" Porous Cell	$1.10
" Glass Jar	18c.
" Amalgamated Zinc	10c.
" Rubber Bands, per pair	6c.
Chlorine Battery, per cell	$1.25
Law Battery, per cell	$1.25
" Jar and its Rubber Ring	25c.
" Cover, with small Carbon sealed in	35c.
" Large Carbons, each	20c.
" Carbon Connector	12c.
" Zinc Connector	8c.
" Rubber Bolt	12c.
" Zinc and its Rubber Ring	12c.
Bergman & Haid, per cell	$1.20
Crow foot, 6x8, per cell	75c.
Callaud Zincs	30c.
" Coppers	15c.
" Jars	25c.
Sal Ammoniac, per lb	15c.
Blue vitriol, per lb	10c.
" " bbl., lots, per lb	5½c
Sulphate of zinc	10c.
Battery syringe	$1.90c.
Battery brush	20c.
Hydrometer	50c.

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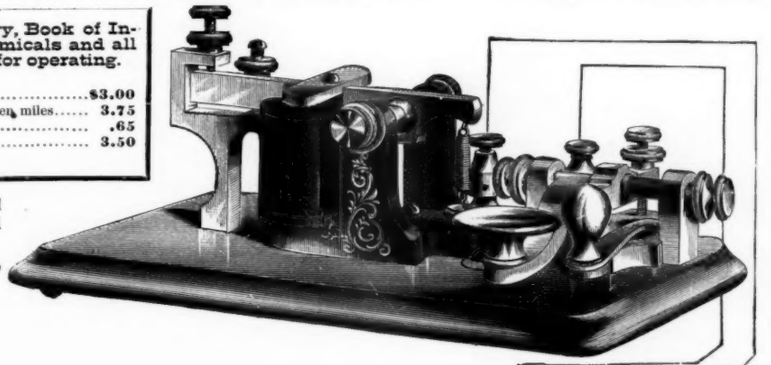

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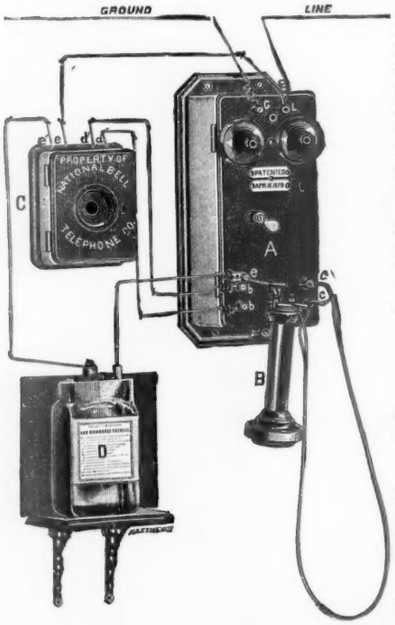

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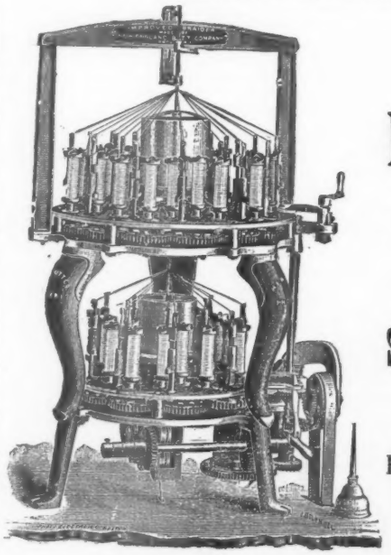

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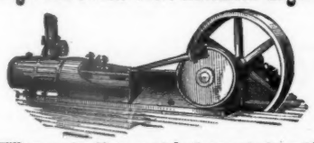

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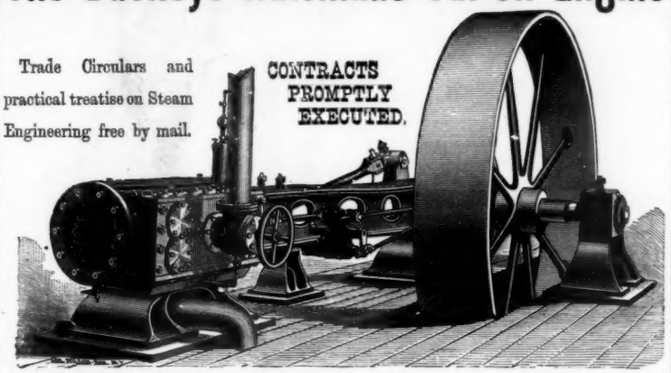

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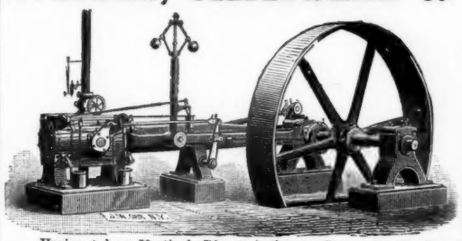

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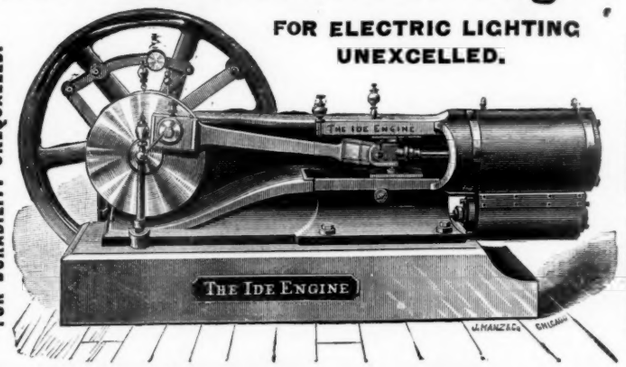

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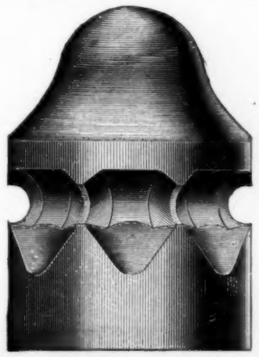

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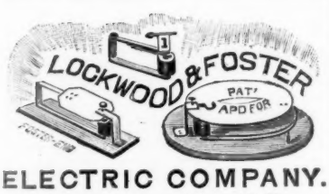

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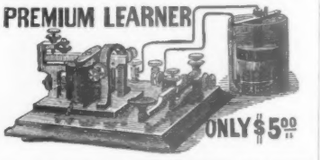

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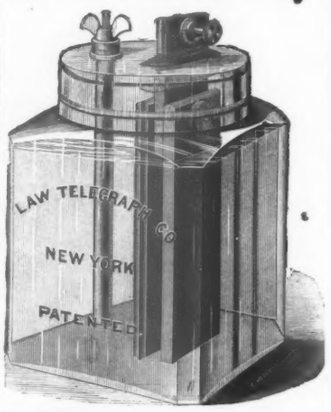

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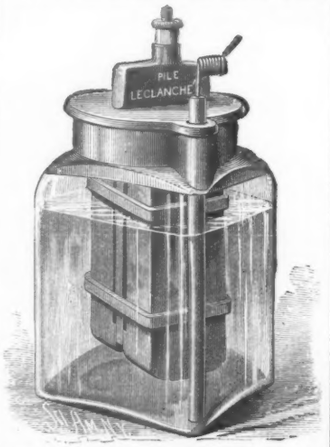

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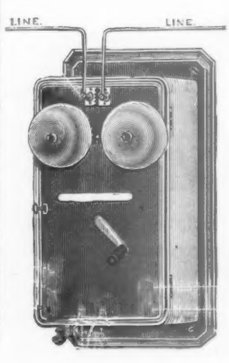

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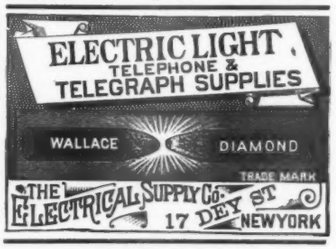

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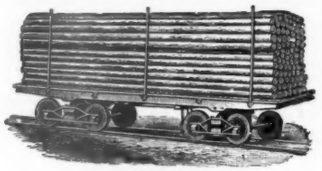

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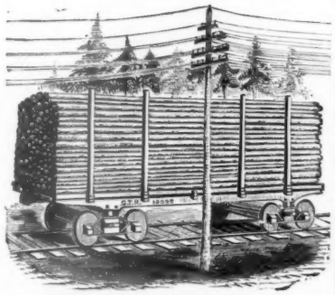

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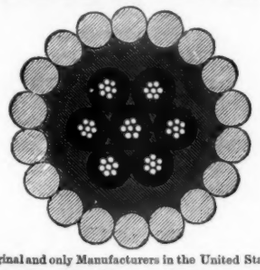

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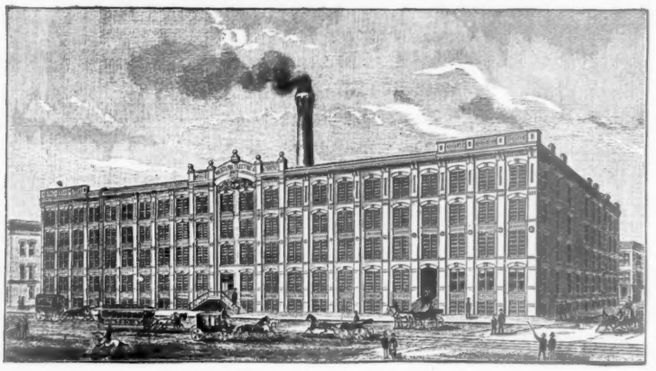

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